



**CITY OF NEWARK
DELAWARE**

CITY OF NEWARK
SOUTH WELL FIELD WATER TREATMENT PLANT UPGRADES
CONTRACT NO. 19-10

ADDENDUM 3
NOVEMBER 5, 2019

1. Notice to Bidders

- A. This Addendum is issued to all registered plan holders pursuant to the Conditions of the Contract. This Addendum serves to clarify, revise, and supersede information in the Project Manual, Drawings, and previously issued Addenda. Portions of the Addendum affecting the Contract Documents will be incorporated into the Contract by enumeration of the Addendum in the Owner/Contractor Agreement.
- B. The Bidder shall acknowledge receipt of all issued Addenda with their submitted proposal.
- C. Bid Documents must be received in the Purchasing Office prior to 2:00 p.m. prevailing time, November 12, 2019. Each bid so submitted shall constitute an irrevocable offer for a period of sixty (60) calendar days following the bid opening date.

2. Revisions

- A. Replace Specification Section 03 30 00 – Cast-in-Place Concrete with the attached Specification Section 03 30 00 – Cast-in-Place Concrete – Bid Addendum #3. See Appendix A.
- B. Replace Specification Section 08 33 23 – Overhead Coiling Doors with the attached Specification Section 08 33 23 – Overhead Coiling Doors – Bid Addendum #3. Paragraph 2.05.G.1 has been revised. Refer to Q1 in Addendum 2 for explanation. See Appendix A.
- C. Replace Drawing C-07 – Air Stripper Building Details with the attached Drawing C-07 – Air Stripper Building Details Addendum #3. Paragraph 2.13.B has been revised. See Appendix B.
- D. Replace Drawing Sheet D-09 – Air Stripper Bldg. Sections with the attached Drawing Sheet Drawing D-09 – Air Stripper Bldg. Sections Addendum #3. See Appendix B.
- E. Replace Drawing E-06 – Air Stripper Building Power Plan with the attached Drawing E-06 – Air Stripper Building Power Plan Addendum #3. Refer to Q1 in Addendum 2 for explanation. See Appendix B.

- F. Replace Drawing E-11 – Electrical Riser Diagrams with the attached Drawing E-11 – Electrical Riser Diagrams Addendum #3. Refer to Q1 in Addendum 2 for explanation. See Appendix B.
- G. Replace Drawing E-12 – Panelboard Schedules with the attached Drawing E-12 – Panelboard Schedules Addendum #3. Refer to Q1 in Addendum 2 for explanation. See Appendix B.

QUESTIONS & ANSWERS

Q1: Sheet S4 note 3 calls for environmental Concrete, please provide any special mix designs that may be required.

A1: Specification 03 30 00 Para. 2.13.B has been revised. See Appendix A.

Q2: Sheet P-03 Shows walls sleeve and Link Seals for penetrations however, the standard detail on D12 just shows the openings to be caulked shut, please specify which you would prefer.

A2: The detail on sheet D-12 applies to vertical process pipe penetrations through the floor slab of the Air Stripper Building. The details on sheet P-03 refer to plumbing components.

Q3: P-09 shows Stainless Steel air inlets and ductwork, please confirm that your air stripper manufacturer will provide these to the GC for installation.

A3: There is no sheet P-09. Sheet D-09 shows stainless steel air inlet/outlet piping and Air Stripper exhaust. A portion of the air inlet piping will be provided by the manufacturer for installation by the GC. This portion of piping is identified as such on D-08 and Section B on D-09 with shading that notes "PROVIDED BY AIR STRIPPER VENDOR". The remainder of the inlet piping shall be provided by the GC. The air stripper exhaust ductwork is not supplied by the air stripper manufacturer and shall be supplied by the GC.

Q4: Please provide the spec section for the Hoist and Trolley

A4: Sheet S-04 specified the hoist to be 2 ton low headroom, Chester Hoist ELM-1 (or approved equal).

Q5: Please increase the hatch size in the elevated slab to at least 48"x48" to allow for the proper removal of concrete forms once the slab has been poured.

A5: The hatch size cannot be increased without further analysis of the slab and potential redesign.

Q6: Will there be an MTO provided?

A6: No.

Q7: Will any more drawings be released?

A7: No new drawings are being issued. Addendum 3 includes revised drawings. See Item #2 – Revisions and Appendix B.

Q8: On drawing D-09 DETAIL B – Is the mechanical joint x plain end sleeve coming up through the floor from the raw water feed supposed to be mechanical joint x flanged with the flanged end facing up through the floor?

A8: Yes, the sleeve should be mechanical joint x flanged with the flanged end facing up. Note has been revised on Sheet D-09. See Appendix B.

Q9: What will our tie ins to the tank be from the vendor – Flanged, plain end?

A9: The finished water tank contractor is to install the inlet/outlet piping to 5' outside the tank. The finished water tank contractor is also to install the 12" isolation valve on the inlet line that falls within the 5' of supplied piping per drawing D-10. The general contractor will need to coordinate with the tank contractor regarding the tie-in, but all underground piping is to be mechanical joint.

Q10: Will any isometric drawings be released?

A10: No.

Q11: Is there an MTO?

A11: See Q6.

Q12: Will the tank supplier be delivering the 250,000 Gallon tank as a complete unit with all piping, tank proper and underground, installed? Mechanical contractor tie ins would be (2) Inlet/outlet tie ins 5' off ringwall and (1) 12" Overflow.

A12: Yes. See response to Q9 as well as drawing D-10 for additional information. Tank supplier will supply and install 12" overflow piping that is affixed to the tank. GC will be responsible for the overflow vault structure and related piping.

Q13: Who is supplying pumps?

A13: The GC shall supply pumps, with the exception of the existing caustic feed pumps shown on D-08. These caustic feed pumps are located on site in the Filter Building and need to be relocated as shown on D-08.

Q14: Has the paint on the pipe, existing equipment and pumps been tested for lead?

A14: No.

Q15: Is there any documentation for asbestos on site?

A15: See Brightfields letter/report dated April 3, 2019 included in Section 02 41 19 of the project specifications.

Q16: Will all lead and asbestos abatement be handle by City of Newark?

A16: No. See Section 02 41 19 of the Specifications and item PB-25 (as it relates to tank demolition) and Q7 of Addendum 1.

Q17: Do you have an estimated weight for the pump motor on Sheet D-06 to be removed?

A17: See Q8 in Addendum 2.

Q18: Are any lines steam traced?

A18: No.

Q19: Are any lines insulated?

A19: No process pipes are to be insulated. Insulate HVAC ducts and piping as indicated on Sheet M-01 – HVAC Note 3 – Insulation. Insulate plumbing piping as indicated on Sheet P-01 – Plumbing Note 2 – Insulation. Insulate in accordance with Sections 23 05 20 – HVAC Insulation and 22 04 20 – Plumbing Insulation.

Q20: Do the ductile iron lines remain ductile iron mechanical joints when they transition aboveground?

A20: Ductile iron piping above grade to be flanged. See specification Section 40 23 00 Para. 2.02-F.

Q21: Who is responsible for lead abatement?

A21: See Q16.

Q22: can you provide contact information for:

- Fire Alarm Vendor
- Allied Control Services
- Tank Vendor for 250,000 ga. Tank

A22:

- Fire Alarm Vendor – Contractor is responsible for fire alarm. See Section 28 46 00
- Allied Control Services – provided in project specifications
- Tank Vendor for 250,000 ga. Tank – to be named under separate contract award

Q23: Is the Landscape part of our bid pack? It is not listed in the scope of work.

A23: Yes. See sheet LA-01 and Section 32 93 00 of the Specifications.

Q24: Is there a detail or can a detail be provided for the pipe support?

A24: Pipe supports are addressed in Section 40 23 19.01-2 of the Specifications. Note 3 on Sheet D-08 states "All required pipe supports to be determined by Contractor and to be installed by the Contractor. Pipe supports shown are only for reference and actual placement to be determined by contractor."

Q25: The acoustical metal decking spec section called for a panel system which appears to require support beams and other structural components which are not shown on the drawings. In addition, the only detail that I can find that call for any sort of ceiling is on S-07 on the bottom right hand portion of the sheet. Is this detail showing the Epic Epicore product? If so, where does this product get installed? Is it throughout the entire ceiling attached to the wood trusses?

A25: The decking will be screwed to the wood trusses with Type 316 stainless steel screws with a rubber or plastic grommet. Since the panels are 24" wide, they need to be run perpendicular to the trusses and attached two times at each truss. Detail on Drawing Sheet C-07 has been revised. See Appendix B.

Q26: At the prebid it was mentioned that the entire plant will and can be shut down for 200 consecutive days, please confirm.

A26: See revised bidding schedule and time of completion in Addendum 1. Plant operations can be shut down as soon as the contractor is ready to begin construction.

Q27: Prior to demolition, will the owner drain and clean the tanks?

A27: See Q16 in Addendum 2.

Q28: Can details for the following be provided?

- Drawing D07 item #15 is missing detail.
- Drawing D07 pipe support inside of concrete vault missing detail.
- Drawing D09 missing support details for 6" DIP Support. Detail given missing attachment clarifications
- Drawing D09 support detail on 8" and 12" into air stripper
- Drawing D08 missing support details on two supports on pump discharge

A28: See Q24.

Q29: What is detail for inline fan on sheet M-05 for?

A29: Inline fan detail is for exhaust fans EF-1 and EF-2. The specified in-line fans do not have the ducted inlet indicated in the detail.

Q30: Has an asbestos survey been done and who is responsible for removal of asbestos?

A30: See Q16.

APPENDIX A
REVISED SPECIFICATIONS

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Footings.
2. Foundation walls.
3. Slabs-on-grade.
4. Suspended slabs
5. Concrete Beams
6. Equipment foundations

1.02 REFERENCES

A. Definitions

1. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

B. Reference Standards

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

1. American Concrete Institute (ACI)
 - a. ACI 117 Specifications for Tolerances for Concrete Construction and Materials.
 - b. ACI 301-10 Specifications for Structural Concrete, Sections 1 through 5.
 - c. ACI 302.1R Guide for Concrete Floor and Slab Construction
 - d. ACI 305 Hot Weather Concreting
 - e. ACI 306.1 Standard Specification for Cold Weather Concreting
 - f. ACI 308.1 Guide to Curing Concrete

- g. ACI 318-11 Building Code Requirements for Structural Concrete and Commentary
 - h. ACI 347 Guide for Shoring/Reshoring of Concrete Multistory Buildings
 - i. ACI 350-06 Environmental Engineering Concrete Structures
 - j. ACI CP-1 Manual of Concrete Practice Part 1: ACI 104-71R-97 to 223-98
2. American Institute of Steel Construction (AISC)
- a. Code of Standard Practice for Steel Buildings and Bridges
3. ASTM International (ASTM)
- a. ASTM A82/A82M Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
 - b. ASTM A184/A184M Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
 - c. ASTM A185/A185M Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
 - d. ASTM A496/A496M Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement
 - e. ASTM A497/A497M Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete
 - f. ASTM A615/A615M Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
 - g. ASTM A706/A706M Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
 - h. ASTM C31/C31M Standard Practice for Making and Curing Concrete Test Specimens in the Field
 - i. ASTM C33 Standard Specification for Concrete Aggregates
 - j. ASTM C39/C39M Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
 - k. ASTM C42/C42M Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
 - l. ASTM C94/C94M Standard Specification for Ready-Mixed Concrete
 - m. ASTM C109/C109M Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)
 - n. ASTM C143/C143M Standard Test Method for Slump of Hydraulic-Cement Concrete
 - o. ASTM C150 Standard Specification for Portland Cement
 - p. ASTM C171 Standard Specification for Sheet Materials for Curing Concrete
 - q. ASTM C172 Standard Practice for Sampling Freshly Mixed Concrete
 - r. ASTM C219 Standard Terminology Relating to Hydraulic Cement

- s. ASTM C231 Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
- t. ASTM C260 Standard Specification for Air-Entraining Admixtures for Concrete
- u. ASTM C309 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
- v. ASTM C330 Standard Specification for Lightweight Aggregates for Structural Concrete
- w. ASTM C494/C494M Standard Specification for Chemical Admixtures for Concrete
- x. ASTM C567 Determining Density of Structural Lightweight Concrete
- y. ASTM C595 Standard Specification for Blended Hydraulic Cements
- z. ASTM C881 Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
- aa. ASTM C989 Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
- ab. ASTM C1017/C1017M Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
- ac. ASTM C1059/C1059M Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete
- ad. ASTM C1064/C1064M Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
- ae. ASTM C1077 Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
- af. ASTM C1240 Standard Specification for Silica Fume Used in Cementitious Mixtures
- ag. ASTM D448 Standard Classification for Sizes of Aggregate for Road and Bridge Construction
- ah. ASTM D1751 Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
- ai. ASTM D4397 Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications
- aj. ASTM E329 Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction
- ak. ASTM E1643 Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs
- 4. American Welding Society (AWS)
 - a. AWS D1.4/D1.4M Structural Welding Code - Reinforcing Steel
- 5. Concrete Reinforcing Steel Institute (CRSI)
 - a. CRSI 10MSP Manual of Standard Practice

6. U.S. Department of Commerce (DOC)
 - a. DOC PS 1 Construction and Industrial Plywood
7. National Ready Mix Concrete Association (NRMCA)
 - a. Certification of Ready Mixed Concrete Production Facilities

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meetings

1. Conduct pre-installation meeting at Project site.
2. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete subcontractor.
 - e. Special concrete finish subcontractor.
3. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, concrete repair procedures, and concrete protection.

1.04 SUBMITTALS

Engineer review is required for submittals designated as "Action Submittals". Submittals not designated as "Action Submittals" are for Contractor Quality Control approval and are to be submitted to Engineer for information only. Submit the following in accordance with Section 01 33 00 – SUBMITTAL PROCEDURES:

A. Action Submittals

1. Product Data
 - a. For each type of product indicated.
2. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, and other circumstances warrant adjustments.

- a. Indicate amounts of mixing water to be withheld for later addition at Project site.
 - 3. Shop Drawings
 - a. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Indicate bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
 - b. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.
 - c. Shoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.
 - 4. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - a. Location of construction joints is subject to approval of the Engineer.
- B. Informational Submittals
- 1. Certificates
 - a. Welding certificates.
 - b. Material Certificates: For each of the following, signed by manufacturer:
 - 1) Cementitious materials.
 - 2) Admixtures.
 - 3) Form materials and form-release agents.
 - 4) Steel reinforcement and accessories.
 - 5) Fiber reinforcement.
 - 6) Waterstops.
 - 7) Curing compounds.
 - 8) Floor and slab treatments.
 - 9) Bonding agents.
 - 10) Adhesives.
 - 11) Vapor retarders.
 - 12) Semirigid joint filler.
 - 13) Joint-filler strips.
 - 14) Repair materials.

2. Test and Evaluation Reports
 - a. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
 - 1) Aggregates. service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
3. Field Quality Control Submittals
 - a. Field quality-control reports.
4. Special Procedure Submittals
 - a. Minutes of pre-installation conference.
5. Qualification Statements
 - a. For testing agency.

C. Closeout Submittals

Not Used

D. Maintenance Material Submittals

Not Used

1.05 QUALITY ASSURANCE

A. Qualifications

1. Manufacturer
 - a. A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
 - b. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
2. Fabricator
 - a. Welding Qualifications: qualify procedures and personnel according to AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."
3. Testing Agency
 - a. An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C1077 and ASTM E329 for testing indicated.
 - 1) Ensure personnel conducting field tests are qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 - 2) Ensure personnel performing laboratory tests are ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I and that the testing

agency laboratory supervisor is ACI-certified Concrete Laboratory Testing Technician - Grade II.

- b. Concrete Testing Service: engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements

- 1. Steel Reinforcement: deliver, store, and handle steel reinforcement to prevent bending and damage.
- 2. Waterstops: store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 PRODUCTS

2.01 OWNER-FURNISHED PRODUCTS

Not Used

2.02 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete

- 1. Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish panel sizes that create the least number of joints.
- 2. Plywood, metal, or other approved panel materials.
- 3. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - c. Structural 1, B-B or better; mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: plywood, lumber, metal, or another approved material. Provide lumber dressed on no less than 2 edges and 1 side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with wall thickness resist plastic concrete loads without detrimental deformation.

- D. Pan-Type Forms: glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.
- E. Void Forms: biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.
- F. Chamfer Strips: wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- G. Rustication Strips: wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- H. Form-Release Agent
 - 1. Commercially formulated form-release agent that will not bond with, stain, and adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 2. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- I. Form Ties
 - 1. Factory-fabricated, removable, or snap-off metal or glass-fiber-reinforced plastic form ties that resist lateral pressure of fresh concrete on forms and prevent spalling of concrete on removal.
 - 2. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 - 3. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
 - 4. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.03 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A706/A706M, deformed.
- C. Steel Bar Mats: ASTM A184/A184M, fabricated from ASTM A615/A615M, Grade 60, deformed bars, assembled with clips.
- D. Plain-Steel Wire: ASTM A82/A82M, as drawn.
- E. Deformed-Steel Wire: ASTM A496/A496M.

- F. Plain-Steel Welded Wire Reinforcement: ASTM A1064, plain, fabricated from as-drawn steel wire into flat sheets.
- G. Deformed-Steel Welded Wire Reinforcement: ASTM A497/A497M, flat sheet.
- H. Galvanized-Steel Welded Wire Reinforcement: ASTM A185/A185M, plain, fabricated from galvanized-steel wire into flat sheets.

2.04 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports
 - 1. Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place.
 - 2. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - a. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
 - b. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.05 CONCRETE MATERIALS

- A. Cementitious Material: use the following cementitious materials of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C150, Type I/II, gray. Supplement with ground granulated blast-furnace slag, ASTM C989, Grade 100 or 120.
 - 2. Blended Hydraulic Cement: ASTM C595, Type IS, portland blast-furnace slag cement.
 - 3. Portland Cement: ASTM C150, Type II, for environmental concrete used in the following locations:
 - a. Clearwell
 - b. Influent Receiving Reservoir
 - c. Residual Settling Basins
 - d. Recycle/Decant Reservoir
- B. Silica Fume: ASTM C1240, amorphous silica.
- C. Normal-Weight Aggregates

1. ASTM C33, Class 3S coarse aggregate or better, graded.
 2. Provide aggregates from a single source with documented service record data of no less than 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
 3. Coarse-Aggregate Size: no greater than 1-1/2 inches nominal, comply with recommendations in ACI 350 for Environmental Structures.
 4. Fine Aggregate: free of materials with deleterious reactivity to alkali in cement.
- D. Lightweight Aggregate: ASTM C330, no greater than 1-inch nominal size.
- E. Water: ASTM C94/C94M and potable.

2.06 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C260.
- B. Chemical Admixtures
1. Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete.
 2. Do not use calcium chloride and admixtures containing calcium chloride.
 3. Water-Reducing Admixture: ASTM C494/C494M, Type A.
 4. Retarding Admixture: ASTM C494/C494M, Type B.
 5. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
 6. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F. MasterRheobuild 1000 as manufactured by Master Builders.
 7. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
 8. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
- C. Set-Accelerating Corrosion-Inhibiting Admixture: commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor that forms a protective barrier and minimizes chloride reactions with steel reinforcement in concrete and complying with ASTM C494/C494M, Type C.
1. Products: subject to compliance with requirements, provide one of the following:
 - a. Axim Italcementi Group, Inc.; CATEXOL CN-CI.
 - b. BASF Construction Chemicals - Building Systems; MasterLife CI 30.

- c. Grace Construction Products, W. R. Grace & Co.; DCI.
 - d. Sika Corporation; Sika CNI.
- D. Non-Set-Accelerating Corrosion-Inhibiting Admixture: commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor that forms a protective barrier and minimizes chloride reactions with steel reinforcement in concrete.
 - 1. Products: subject to compliance with requirements, provide one of the following:
 - a. BASF Construction Chemicals - Building Systems; MasterLife CI 222.
 - b. Grace Construction Products, W. R. Grace & Co.; DCI-S.
 - c. Sika Corporation; FerroGard 901.

2.07 WATERSTOPS

- A. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Westec
 - b. Greenstreak.
 - c. Paul Murphy Plastics Company.
 - d. Vinylex Corp.
 - e. BoMetals, Inc.
 - 2. Profile: flat, ribbed with center bulb, dumbbell with center bulb.
 - 3. Dimensions: 6 inches by 3/8 inch thick ; nontapered.

2.08 VAPOR RETARDERS

- A. Sheet Vapor Retarder: polyethylene sheet, ASTM D4397, not less than 10 mils thick.
- B. Granular Fill: clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D448, Size 57, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.
- C. Fine-Graded Granular Material: clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D448, Size 10, with 100 percent passing a 3/8-inch sieve, 10 to 30 percent passing a No. 100 sieve, and at least 5 percent passing No. 200 sieve; complying with deleterious substance limits of ASTM C33 for fine aggregates.

2.09 CURING MATERIALS

- A. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.
- B. Water: Potable.
- C. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
 - 1. Products: subject to compliance with requirements, provide one of the following:
 - a. Anti-Hydro International, Inc.; A-H Clear Cure WB.
 - b. BASF Construction Chemicals - Building Systems; Kure-N-Seal WB.
 - c. ChemMasters; Safe-Cure & Seal 20.
 - d. Conspec by Dayton Superior; Cure and Seal WB.
 - e. Cresset Chemical Company; Crete-Trete 309-VOC Cure & Seal.
 - f. Dayton Superior Corporation; Safe Cure and Seal (309 J-18).
 - g. Edoco by Dayton Superior; Spartan Cote WB II.
 - h. Euclid Chemical Company (The), an RPM company; Aqua Cure VOX.
 - i. Kaufman Products, Inc.; Cure & Seal 309 Emulsion.
 - j. Lambert Corporation; Lambco Glazecote 20.
 - k. Meadows, W. R., Inc.; Vocomp-20.
 - l. Metalcrete Industries; Metcure.
 - m. Nox-Crete Products Group; Cure & Seal 150E.
 - n. TK Products, Division of Sierra Corporation; TK-2519 WB.
 - o. Vexcon Chemicals, Inc.; Starseal 309.

2.10 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber.
- B. Bonding Agent: ASTM C1059/C1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- C. Epoxy Bonding Adhesive: ASTM C881, two-component epoxy resin, humid curing and that bonds to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

- D. Reglets: fabricate reglets of not less than 0.022-inch- thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete and debris.
- E. Dovetail Anchor Slots: hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete and debris.

2.11 REPAIR MATERIALS

- A. Repair Overlayment: cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C219.
 - 2. Primer: product of topping manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 - 4. Compressive Strength: not less than 5000 psi at 28 days when tested according to ASTM C109/C109M.

2.12 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: use Class F fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume to reduce the total quantity of Portland cement by not less than 40 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.
- D. Admixtures: use admixtures according to manufacturer's written instructions.
 - 1. Use high-range water-reducing or plasticizing admixture in concrete for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.13

CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings: proportion normal-weight concrete mixture as follows:
 1. Minimum Compressive Strength: 4000 psi at 28 days.
 2. Maximum Water-Cementitious Materials Ratio: 0.50.
 3. Slump Limit: 4 inches, plus or minus 1 inch.
 4. Air Content: 5.5 percent, plus and minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
 5. Air Content: 6 percent, plus and minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
- B. Foundation Walls & Base Slab: (Environmental Concrete) Proportion normal-weight concrete mixture as follows:
 1. Minimum Compressive Strength: 5000 psi at 28 days. Cement content not less than 564 lb/cy
 2. Maximum Water-Cementitious Materials Ratio: 0.40 and not less than 0.36.
 3. Slump Limit: 4 inches, plus and minus 1 inch.
 4. Air Content: 5.5 percent, plus and minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
 5. Air Content: 6 percent, plus and minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
- C. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:
 1. Minimum Compressive Strength: 4000 psi at 28 days.
 2. Minimum Cementitious Materials Content: 470 lb/cu. yd.
 3. Slump Limit: 4 inches, plus and minus 1 inch.
 4. Air Content: 5.5 percent, plus and minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
 5. Air Content: 6 percent, plus and minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
 6. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

- D. Suspended Slabs & Concrete Beams: proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 4000 psi at 28 days.
 2. Minimum Cementitious Materials Content: 520 lb/cu. yd.
 3. Slump Limit: 4 inches, plus and minus 1 inch.
 4. Air Content: 5.5 percent, plus and minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
 5. Air Content: 6 percent, plus and minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
 6. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.14 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice".

2.15 CONCRETE MIXING

- A. Ready-Mixed Concrete: measure, batch, mix, and deliver concrete according to ASTM C94/C94M, and furnish batch ticket information.
1. When air temperature is between 85 and 90 degrees Fahrenheit, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 degrees Fahrenheit, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.
1. For mixer capacity of 1 cu. yd. and smaller, continue mixing no less than 1-1/2 minutes, but not longer than 5 minutes after ingredients are in mixer, before a portion of the batch is released.
 2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

2.16 SOURCE QUALITY CONTROL

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

Not Used

3.02 PREPARATION

Not Used

3.03 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301-10 and ACI 350-06 to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch for smooth-formed finished surfaces.
 - 2. Class B, 1/4 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, and recesses for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.04 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.

3.05 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 degrees Fahrenheit for 24 hours after placing concrete. Ensure concrete is hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, and otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Engineer.

3.06 SHORES AND RESHORES

- A. Comply with ACI 318-11, ACI 301-10, and ACI 350-06 for design, installation, and removal of shoring and reshoring.
 - 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B. In multistory construction, extend shoring and reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.07 VAPOR RETARDERS

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.08 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Weld reinforcing bars according to AWS D1.4/D1.4M, where indicated.

- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.09 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 5. Use a bonding agent at locations where fresh concrete is placed against hardened and partially hardened concrete surfaces.
 - 6. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened and partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at no less than 1/4 of concrete thickness as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at each slab junction with vertical surfaces. For example, at column pedestals, foundation walls, and grade beams.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 2. Terminate full-width joint-filler strips not less than 1/2 inch and not more than 1 inch below finished concrete surface where joint sealants are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Lace or clip sections together when more than one length is required.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat 1/2 of dowel length to prevent concrete bonding to one side of joint.

3.10 WATERSTOPS

- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

3.11 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of thickness so that no new concrete will be placed on concrete that has hardened enough to cause seams and planes of weakness. If a section cannot be placed continuously, provide construction joints. Deposit concrete to avoid segregation.
1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and to avoid inclined construction joints.
 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and no less than 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Maintain reinforcement in position on chairs during concrete placement.
 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 4. Slope surfaces uniformly to drains where required.
 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage and reduced strength caused by frost, freezing actions, and low temperatures.
1. When average high and low temperature is expected to fall below 40 degrees Fahrenheit for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 2. Do not use frozen materials and materials containing ice and snow. Do not place concrete on frozen subgrade and on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, and other materials containing antifreeze agents and chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 305 and as follows:
1. Maintain concrete temperature below 90 degrees Fahrenheit at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Liquid nitrogen may be used to cool concrete.

2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, and dry areas.

3.12 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces exposed to public view.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.13 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
 1. Apply float finish to surfaces unless otherwise noted.
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth surface defects that will telegraph through applied coatings and floor coverings.
 1. Apply a trowel finish to surfaces exposed to view and to be covered with resilient flooring, carpet, ceramic and quarry tile set over a cleavage membrane, paint, and another thin-film-finish coating system.

2. Finish and measure surface so gap at each point between concrete surface and an unlevelled, freestanding, 10-ft.- long straightedge resting on two high spots and placed across the entire surface does not exceed 1/4 inch.
- D. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, sidewalks, walkways and elsewhere as indicated.
 1. Immediately after float finishing, slightly roughen trafficked surface by broom with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Engineer before application.

3.14 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in honeycombs, holes, and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling and required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.15 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold and hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, and windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, and before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, floors and slabs, concrete floor toppings, and other surfaces.

- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped no less than 12 inches, and sealed by waterproof tape or adhesive. Cure for no less than seven days. Immediately repair holes and tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
 3. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.16 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas. Remove and replace concrete that cannot be repaired.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part Portland cement to 2–1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins, and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance.
- D. Repairing Unformed Surfaces: Test unformed surfaces, floors, and slabs for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects, spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured no less than 14 days, grind high areas.
 3. During or immediately after completing surface finishing operations cut out low areas and replace with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a repair topping depth of no less than 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes no greater than 1 inch in diameter by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with no less than 3/4-inch clearance on each side. Dampen

concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes no greater than 1 inch in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for no less than 72 hours.

- E. Perform structural repairs of concrete using epoxy adhesive and patching mortar.
- F. Obtain Engineer approval prior to using repair materials and installation not specified above.

3.17 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Provide a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- B. Inspections:
 1. Steel reinforcement placement.
 2. Steel reinforcement welding.
 3. Headed bolts and studs.
 4. Verification of use of required design mixture.
 5. Concrete placement, including conveying and depositing.
 6. Curing procedures and maintenance of curing temperature.
 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- C. Concrete Tests: Perform testing of composite samples of fresh concrete obtained according to ASTM C172 according to the following requirements:
 1. Testing Frequency: Obtain 1 composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but no greater than 25 cu. yd., plus 1 set for each additional 50 cu. yd. and fraction thereof.
 2. Testing Frequency: Obtain no less than 1 composite sample for each 100 cu. yd. and fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, conduct

testing from no less than 5 randomly selected batches or from each batch if fewer than 5 are used.

3. Slump: ASTM C143/C143M; 1 test at point of placement for each composite sample, but not less than 1 test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
4. Air Content: ASTM C231, pressure method, for normal-weight concrete; 1 test for each composite sample, but not less than 1 test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C1064/C1064M; 1 test hourly when air temperature is 40 degrees Fahrenheit and below and when 80 degrees Fahrenheit and above, and 1 test for each composite sample.
6. Unit Weight: ASTM C567, fresh unit weight of structural lightweight concrete; 1 test for each composite sample, but not less than 1 test for each day's pour of each concrete mixture.
7. Compression Test Specimens: ASTM C31/C31M.
 - a. Cast and laboratory cure 2 sets of 2 standard cylinder specimens for each composite sample.
 - b. Cast and field cure 2 sets of 2 standard cylinder specimens for each composite sample.
8. Compressive-Strength Tests: ASTM C39/C39M; test 1 set of 2 laboratory-cured specimens at 7 days and 1 set of 2 specimens at 28 days.
 - a. Test 1 set of 2 field-cured specimens at 7 days and 1 set of 2 specimens at 28 days.
 - b. A compressive-strength test consists of the average compressive strength from a set of 2 specimens obtained from same composite sample and tested at age indicated.
9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
10. Strength of each concrete mixture will be satisfactory if each average of three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
11. Report test results in writing to Engineer within 48 hours of testing. Ensure reports of compressive-strength tests contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device will be considered by Engineer but will not be used as sole basis for approval or rejection of concrete.
13. Additional Tests: make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods approved by Engineer.
14. Provide additional testing and inspecting to determine compliance with specified requirements of replaced and additional work.
15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION

SECTION 08 33 23
OVERHEAD COILING DOORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following types of electric-motor-operated overhead coiling doors:
 - 1. Fire-rated service doors – motor operated
- B. Related Sections include the following:
 - 1. ~~Division 9 Section "Painting" for field-applied paint finish.~~
 - 2. Division 26 Sections for electrical service and connections.

1.03 DEFINITIONS

- A. Operation Cycle: One cycle of a door is complete when it is moved from the closed position to the fully open position and returned to the closed position.

1.04 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide overhead coiling doors capable of withstanding the effects of gravity loads and the following loads and stresses without evidencing permanent deformation of door components:
 - 1. Wind Load: Uniform pressure (velocity pressure) of 20 lbf/sq. ft., acting inward and outward.
 - 2. Impact Test for Flying Debris: Comply with ASTM E 1996, tested according to ASTM E 1886.
 - a. Level of Protection: Basic Protection.
 - b. Wind Zone One 110 mph, pressure test to 1/2 and 1-1/2 x design pressure (positive and negative).
- B. Operation-Cycle Requirements: Provide overhead coiling door components and operators capable of operating for not less than 20,000 cycles and for 20 cycles per day.

1.05 SUBMITTALS

- A. Product Data: For each type and size of overhead coiling door and accessory. Include the following:
 - 1. Summary of forces and loads on walls and jambs.
 - 2. Fire-Rated Doors: Include description of fire-release system including testing and resetting instructions.
- B. Shop Drawings: For special components and installations not dimensioned or detailed in manufacturer's product data.
- C. Samples for Initial Selection: Manufacturer's color charts showing full range of colors available for units with factory-applied finishes.
- D. Samples for Verification: Of each type of exposed finish required, prepared on Samples of size indicated below.
 - 1. Curtain Slats: 12 inches long.
 - 2. Bottom Bar: 6 inches long.
 - 3. Guides: 6 inches long.
 - 4. Brackets: 6 inches square.
 - 5. Hood: 6 inches square.
- E. Qualification Data: Submit Installer qualifications for approval by Field Representative.
- F. Submit data for installed products in accordance with Operations and Maintenance Data, Manual for Operating Manuals in Division 1.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain overhead coiling doors through one source from a single manufacturer.
 - 1. Obtain operators and controls from overhead coiling door manufacturer.
- C. Fire-Test-Response Characteristics: Provide assemblies complying with NFPA 80 that are identical to door and frame assemblies tested for fire-test-response characteristics per UL 10b and NFPA 252, and that are listed and labeled for fire ratings indicated by UL, FMG, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Alpine Overhead Doors, Inc.
 2. Atlas Door; Div. of Clopay Building Products Company, Inc.
 3. Cookson Company.
 4. Cornell Iron Works Inc.
 5. Dynamic Closures Corporation.
 6. Mahon Door Corporation.
 7. McKeon Rolling Steel Door Company, Inc.
 8. Metro Door.
 9. Overhead Door Corp.
 10. Pacific Rolling Doors Co.
 11. Raynor.
 12. Southwestern Steel Rolling Door Co.
 13. Wayne-Dalton Corp.
 14. Windsor Door, a MAGNATRAX Corporation.

2.02 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate overhead coiling door curtain of interlocking slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural steel (SS) sheet; complying with ASTM A 653/A 653M, G90 (Z275) coating designation.
 - a. Minimum Base-Metal (Uncoated) Thickness: 22 gauge
 - b. Flat profile slats.
 - c. ~~Perforated slats, 25 percent of total door opening.~~
 2. Insulation: Fill slat with manufacturer's standard rigid cellular polystyrene or polyurethane-foam-type thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within metal slat faces. Slats to have R-value of 16.0 (U-factor of 0.0625) as calculated using ASHRAE Handbook of Fundamentals.
 3. Inside Curtain Slat Face: To match material of outside metal curtain slat (22 gauge).
- B. Endlocks and Windlocks for Service Doors: Malleable-iron casings galvanized after fabrication, secured to curtain slats with galvanized rivets or high-strength nylon.

Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.

- C. Bottom Bar for Service Doors: Consisting of 2 angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; galvanized to suit type of curtain slats.
- D. Curtain Jamb Guides for Service Doors: Fabricate curtain jamb guides of steel angles or channels and angles, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Build up units with not less than 3/16-inch- thick galvanized steel sections complying with ASTM A 36/A 36M and ASTM A 123/A 123M. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent over-travel of curtain, and a continuous bar for holding wind-locks.

2.03 HOODS AND ACCESSORIES

- A. Hood: Form to act as weatherseal and entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Provide closed ends for surface-mounted hoods and provide fascia for any portion of between-jamb mounting projecting beyond wall face. Provide intermediate support brackets as required to prevent sagging.
 - 1. Fabricate hoods for steel doors of minimum 0.028-inch- thick, hot-dip galvanized steel sheet with G90 (Z275) zinc coating, complying with ASTM A 653/A 653M.
 - 2. Include automatic drop baffle to guard against passage of smoke or flame.
 - 3. Shape: Round.
- B. Smoke Seals: Provide UL-listed and -tested smoke-seal perimeter gaskets.
- C. Weatherseals: Provide replaceable, adjustable, continuous, compressible weather-stripping gaskets fitted to bottom and top of exterior doors. At door head, use 1/8-inch-thick, replaceable, continuous sheet secured to inside of hood.
 - 1. Provide motor-operated doors with combination bottom weatherseal and sensor edge.
 - 2. In addition, provide replaceable, adjustable, continuous, flexible, 1/8-inch- thick seals of flexible vinyl, rubber, or neoprene at door jambs for a weathertight installation.
- D. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.
- E. Chain Lock Keeper: Suitable for padlock.
- F. Power operated doors shall have safety interlock switch to disengage power supply when door is locked.
- G. Provide automatic-closing device that is inoperative during normal door operations, with oscillating governor unit complying with requirements of NFPA 80 and with an easily tested and reset release mechanism, and designed to be activated by the following:

1. Replaceable fusible links with temperature rise and melting point of 165 deg F. interconnected and mounted on both sides of door opening.
2. Building fire alarm and detection system and door-holder-release devices.

2.04 COUNTERBALANCING MECHANISM

- A. General: Counterbalance doors by means of adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to door curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.
- C. Provide spring balance of one or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Provide cast-steel barrel plugs to secure ends of springs to barrel and shaft.
- D. Fabricate torsion rod for counterbalance shaft of cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Provide mounting brackets of manufacturer's standard design, either cast iron or cold-rolled steel plate.

2.05 ELECTRIC DOOR OPERATORS

- A. General: Provide electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycle requirements specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
- B. Comply with NFPA 70.
- C. Disconnect Device: Provide hand-operated disconnect or mechanism for automatically engaging chain and sprocket operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount disconnect and operator so they are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- D. Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.

- E. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V, ac or dc.
- F. Door-Operator Type: Provide wall, hood, or bracket-mounted, jackshaft-type door operator unit consisting of electric motor, enclosed gear-head-reduction drive, and chain and sprocket secondary drive.
- G. Electric Motors: Provide high-starting torque, reversible, continuous-duty, Class A insulated, electric motors complying with NEMA MG 1; with overload protection; sized to start, accelerate, and operate door in either direction from any position, at not less than 2/3 fps and not more than 1 fps, without exceeding nameplate ratings or service factor.
 - 1. Type: Polyphase, medium-induction type. Motor shall be 1/2 hp, 480 volts.
 - 2. Service Factor: According to NEMA MG 1, unless otherwise indicated.
 - 3. Coordinate wiring requirements and electrical characteristics of motors with building electrical system.
 - 4. Provide open drip proof-type motor, and controller with NEMA ICS 6, Type 1 enclosure.
- H. Remote-Control Station: Provide momentary-contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop."
 - 1. Provide interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
- I. Obstruction Detection Device: Provide each motorized door with indicated external automatic safety sensor capable of protecting full width of door opening. Activation of sensor immediately stops and reverses downward door travel.
 - 1. Sensor Edge: Provide each motorized door with an automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor immediately stops and reverses downward door travel. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
 - a. Provide pneumatically actuated automatic bottom bar.
 - 1) Self-Monitoring Type: Four-wire configured device.
- J. Limit Switches: Provide adjustable switches, interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- K. Provide electric operators with ADA-compliant audible alarm and visual indicator lights.

2.06 FINISHES, GENERAL

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other

components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.07 STEEL AND GALVANIZED STEEL FINISHES

- A. Factory Primer for Field Finish: Manufacturer's standard primer, compatible with field-applied finish according to coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.
 - 1. Apply to ferrous surfaces except zinc-coated metal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: Install coiling doors and operating equipment complete with necessary hardware, jamb and head molding strips, anchors, inserts, hangers, and equipment supports.
 - 1. Install fire-rated doors to comply with NFPA 80.

3.02 ADJUSTING

- A. Lubricate bearings and sliding parts; adjust doors to operate easily, free of warp, twist, or distortion and with weathertight fit around entire perimeter.

3.03 STARTUP SERVICES

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. Submit written testing procedures for approval by Owner's Representative.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - a. Test door closing when activated by detector or alarm-connected fire-release system. Reset door-closing mechanism after successful test.

3.04 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Contracting Authority's maintenance personnel to adjust, operate, and maintain overhead coiling doors. Refer to applicable Division 1 Sections on Closeout Procedures and Demonstration and Training.

END OF SECTION

APPENDIX B
REVISED DRAWING SHEETS

PROJECT

SOUTH WELL FIELD
WATER TREATMENT
PLANT UPGRADES

OWNER

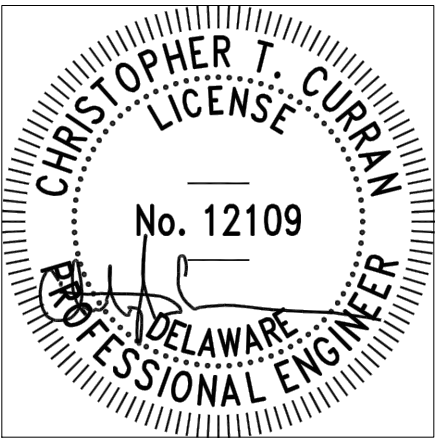
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REGISTRATION



ISSUE/REVISION

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0	2019-09-27	ISSUE FOR BID
I/R	DATE	DESCRIPTION

KEY PLAN

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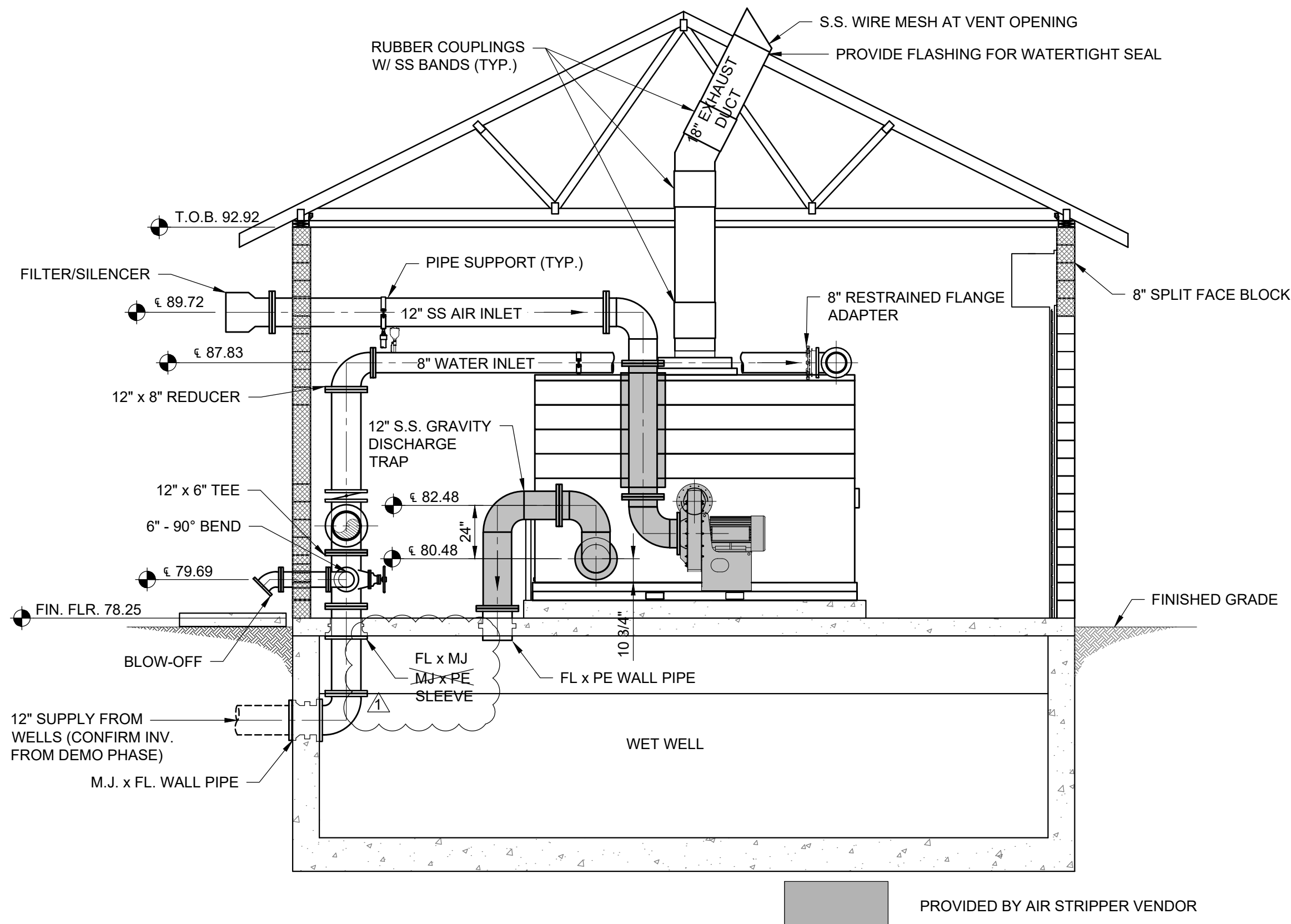
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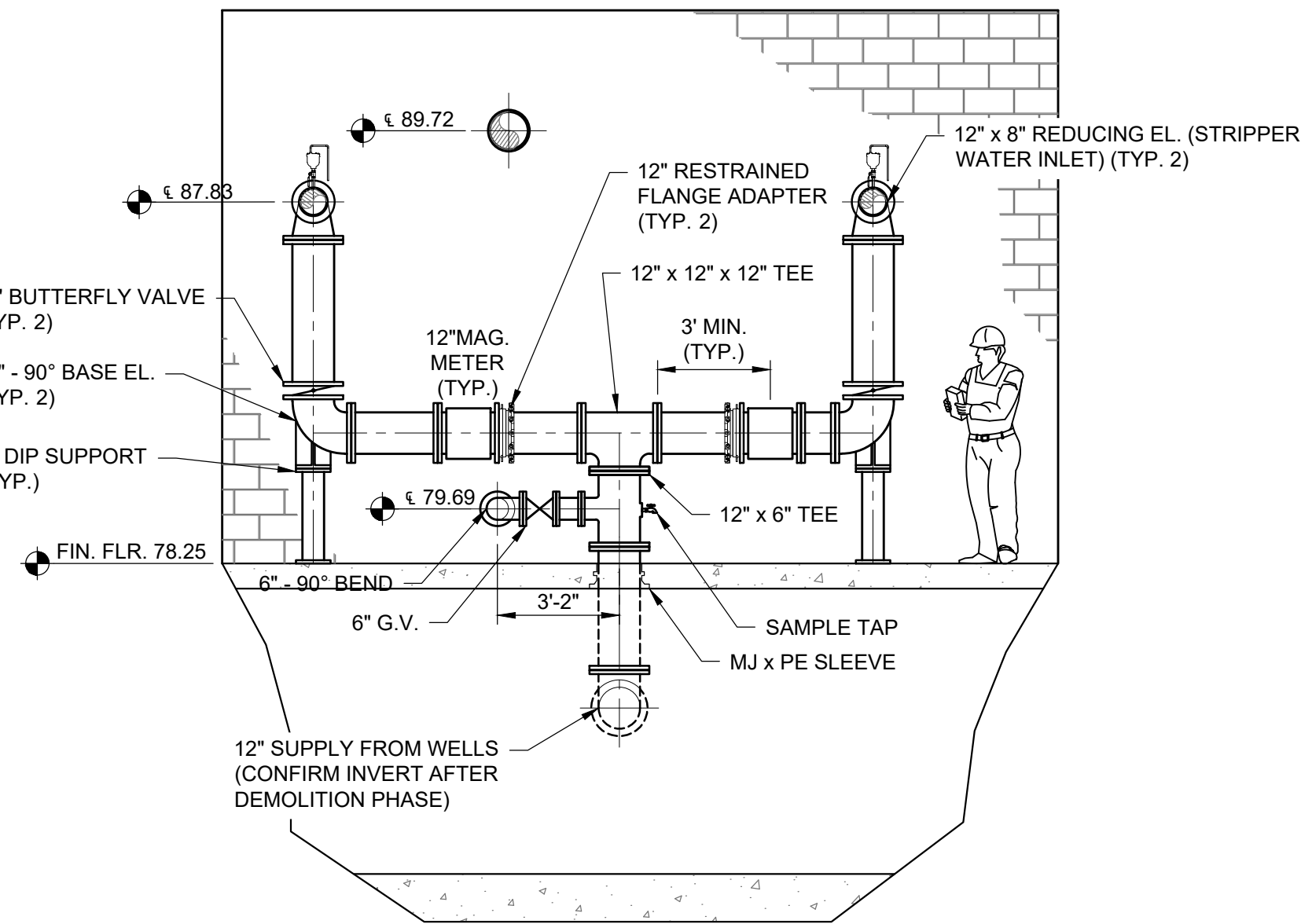
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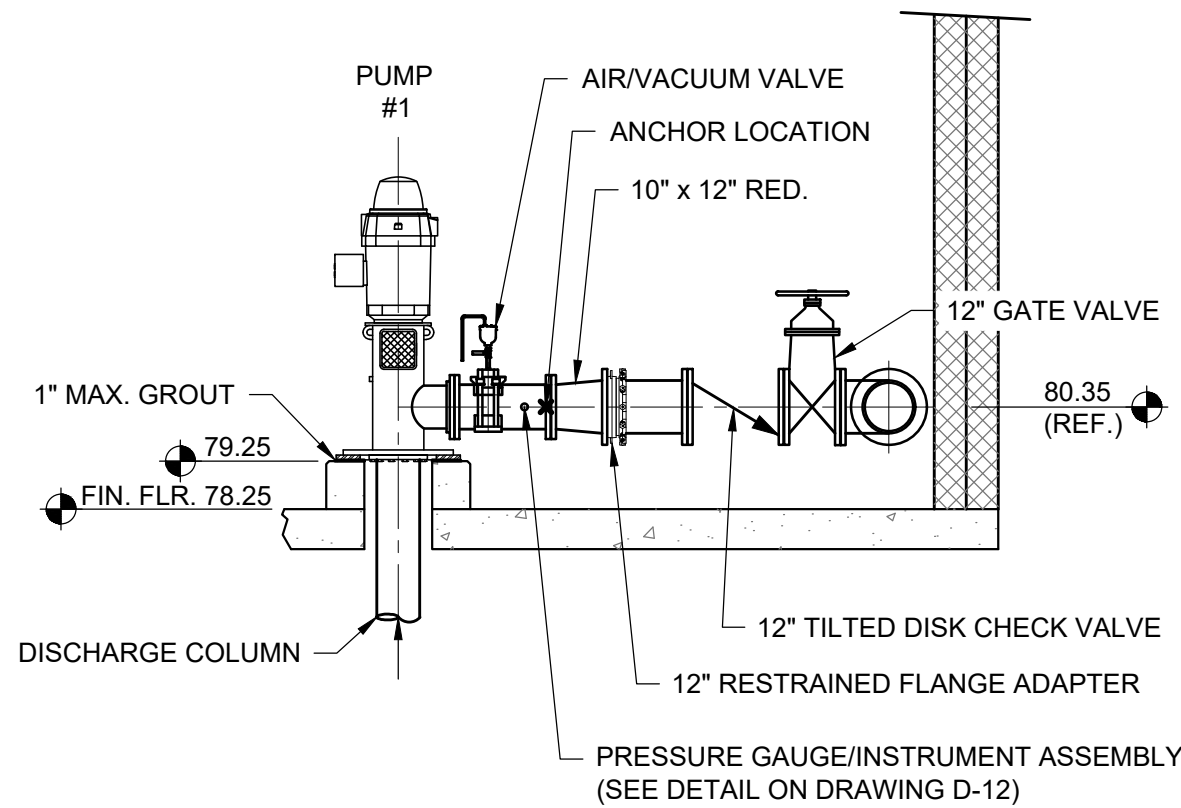
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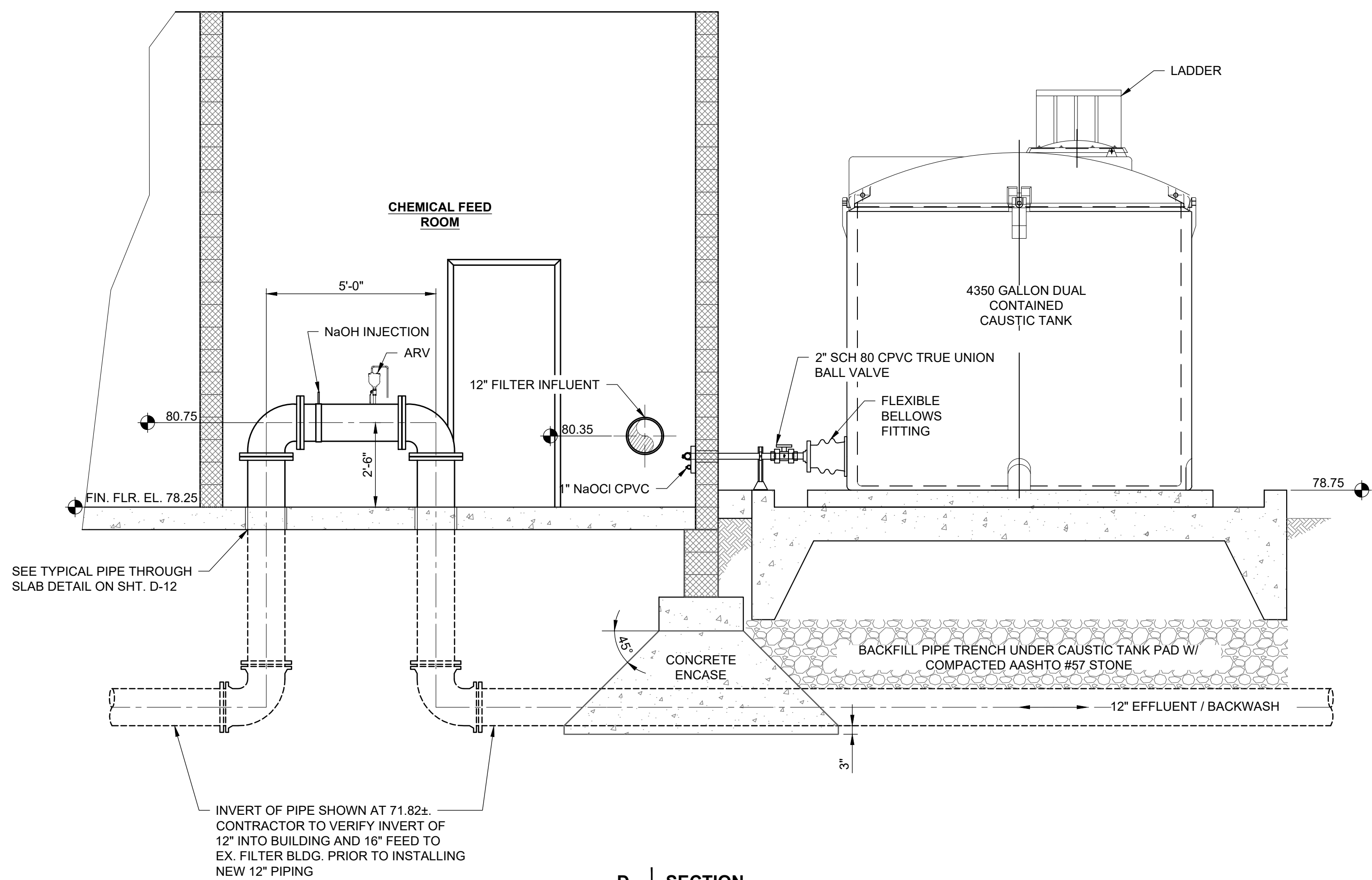
B SECTION
D-08 Scale: 1/4" = 1'-0"



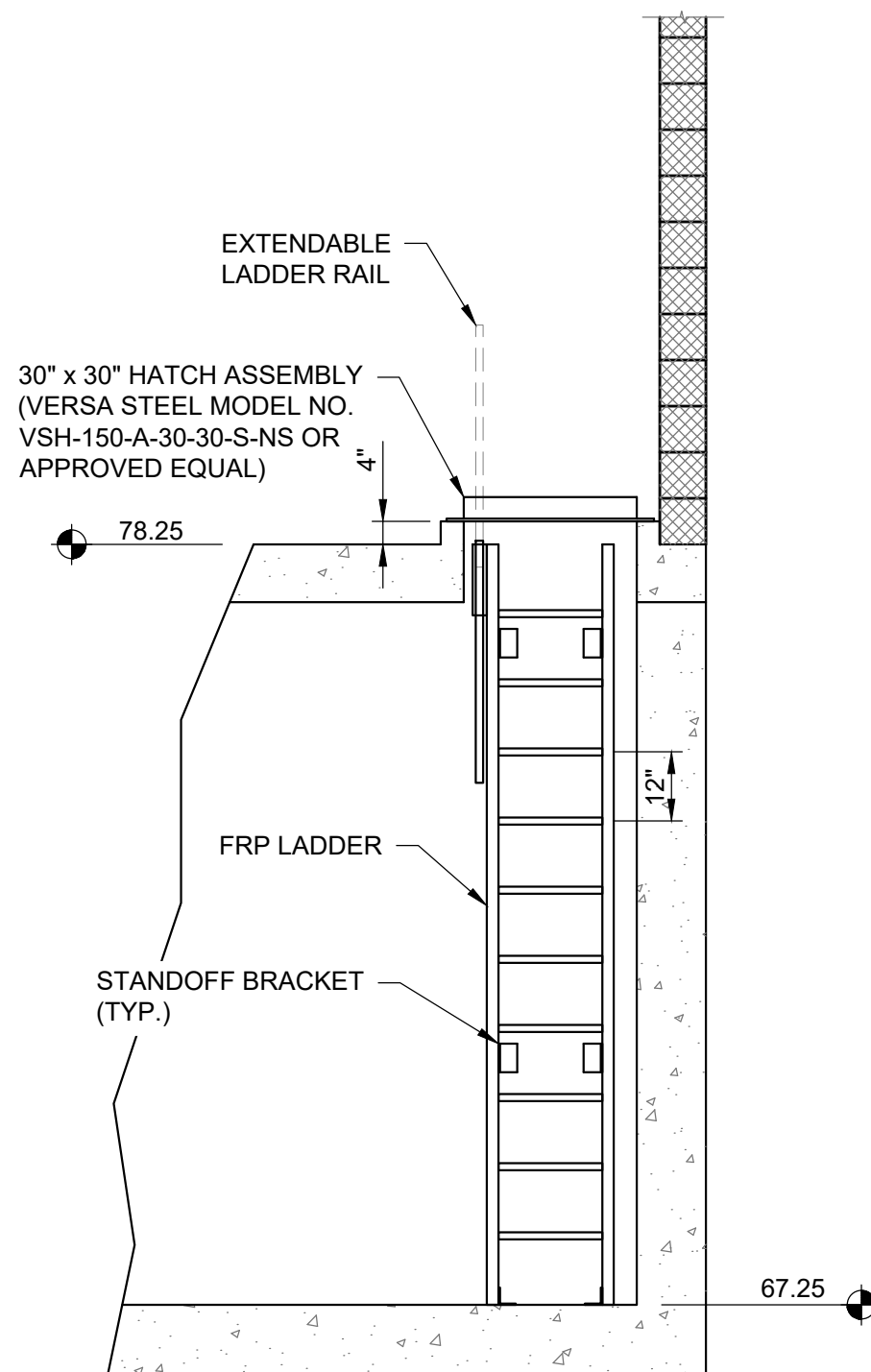
C SECTION - BLOW-OFF
D-08 Scale: 1/4" = 1'-0"



F SECTION
D-08 Scale: 1/4" = 1'-0"



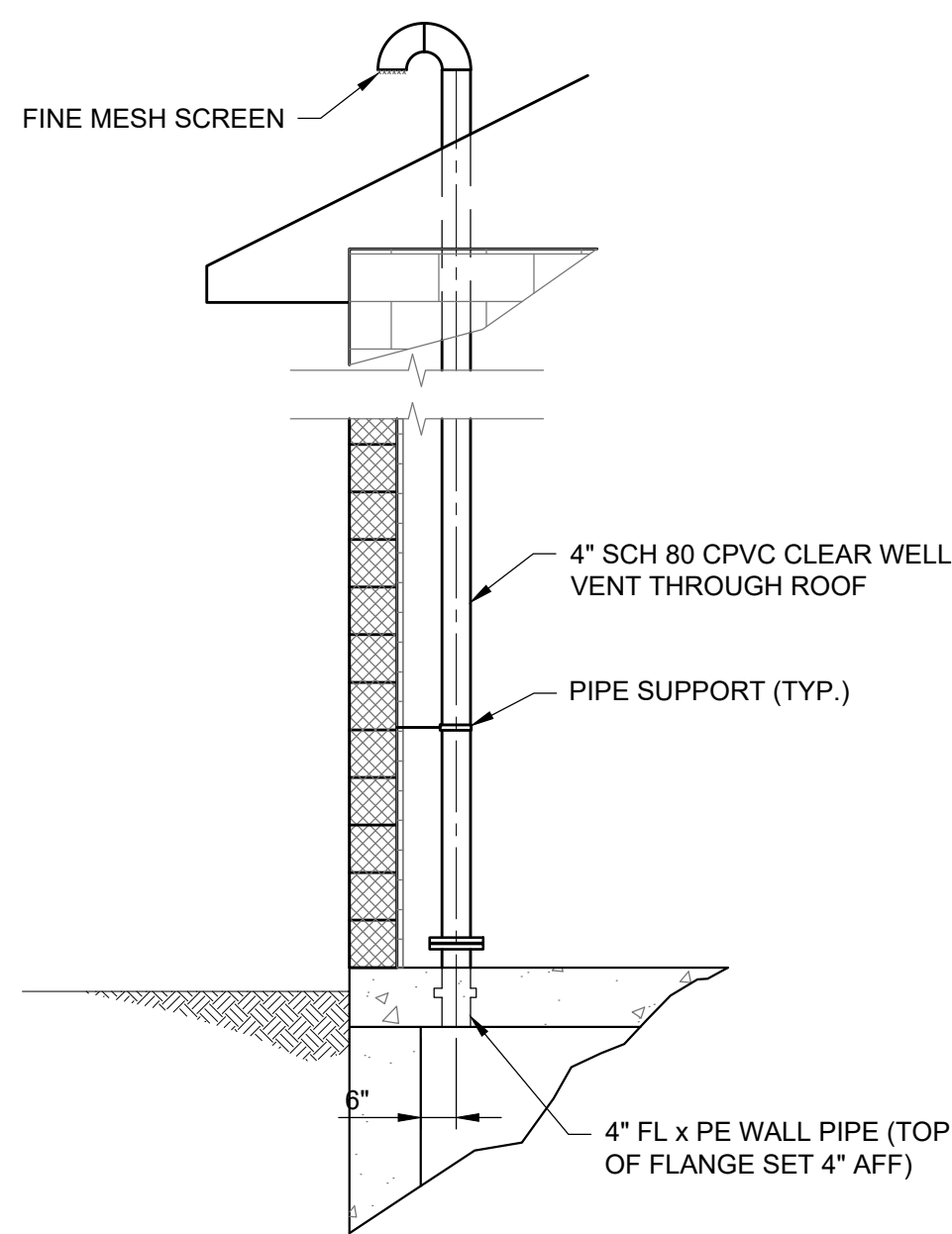
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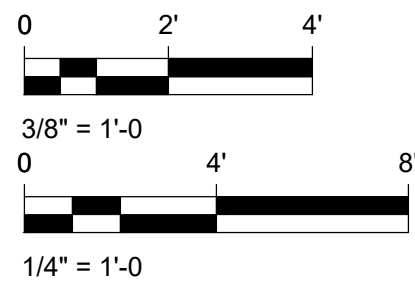
NOTES:

1. PROVIDE TWO CLEAR WELL ACCESS LADDERS WITH COVERS. SEE SECTIONS FOR OTHER LADDER HEIGHT.
2. COAT ALL ALUMINUM IN CONTACT WITH CONCRETE WITH A BITUMASTIC COATING.
3. FRP LADDER SHALL BE IN ACCORDANCE WITH STANDARD NSF/ANSI-61 CERTIFIED FOR DRINKING WATER.

E SECTION - CLEAR WELL ACCESS
D-08 Scale: 3/8" = 1'-0"



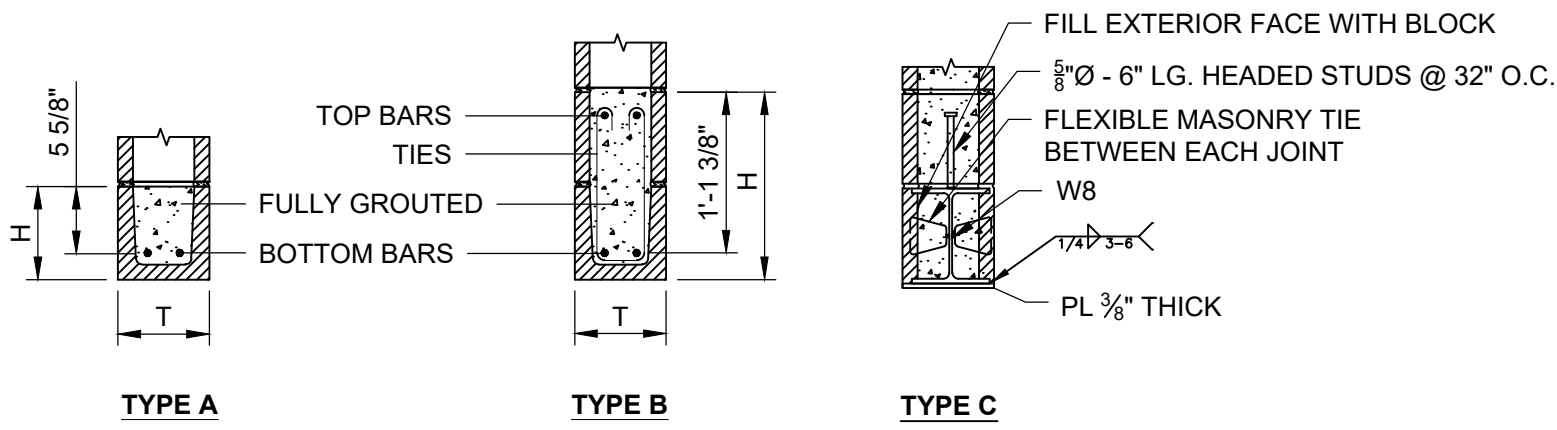
G SECTION - CLEAR WELL VENT
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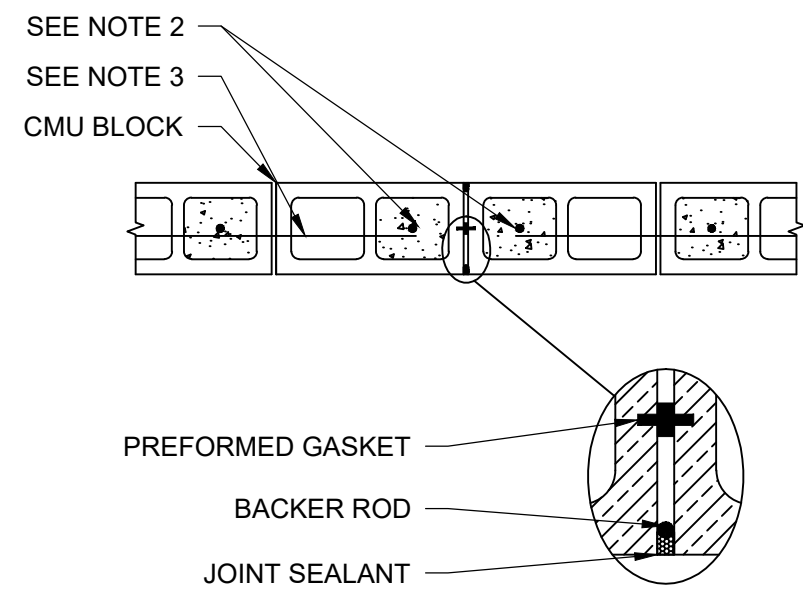
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I/R	DATE	DESCRIPTION

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				TOP	BOTTOM	TIES	
L1	A	7 $\frac{7}{8}$ "	7 $\frac{7}{8}$ "	-	2 - #5	-	5'-4" MAX. SPAN
L2	B	15 $\frac{1}{2}$ "	7 $\frac{7}{8}$ "	2 - #4	2 - #5	#3 @ 8	8'-0" MAX. SPAN
L3	C	-	-	-	-	-	SEE DETAIL

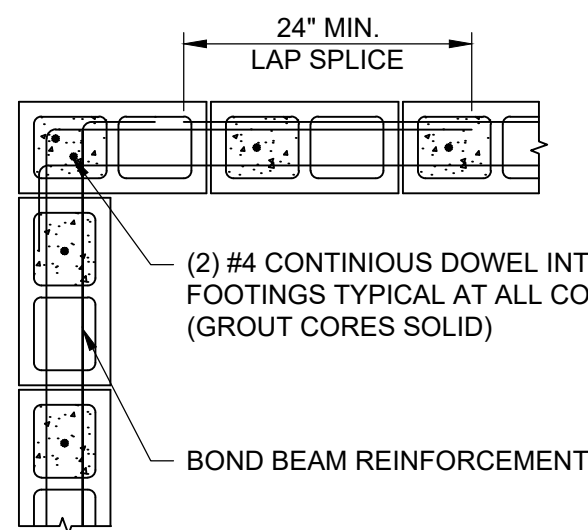
- NOTES:
1. MINIMUM MASONRY STRENGTH SHALL BE $F_m=2000$ psi.
 2. GROUT FILL SHALL CONFORM TO ASTM C476 WITH A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI AT 28 DAYS. MAXIMUM $\frac{3}{4}$ " AGGREGATE.
 3. BEARING OVER SUPPORTS SHALL BE 8" MINIMUM FOR CLEAR SPANS LESS THAN OR EQUAL TO 6 FT AND 16" FOR CLEAR SPANS GREATER THAN 6 FT.
 4. TOP AND BOTTOM REINFORCEMENT SHALL EXTEND A MINIMUM OF 6" OVER SUPPORT AT EACH END.
 5. PROVIDE FULL MORTAR HEAD AND BED JOINTS.
 6. SHORE FILLED LINTELS AS REQUIRED.
 7. ALL CMU BLOCK ABOVE OVERHEAD DOOR LINTEL SHALL BE GROUTED FULL.



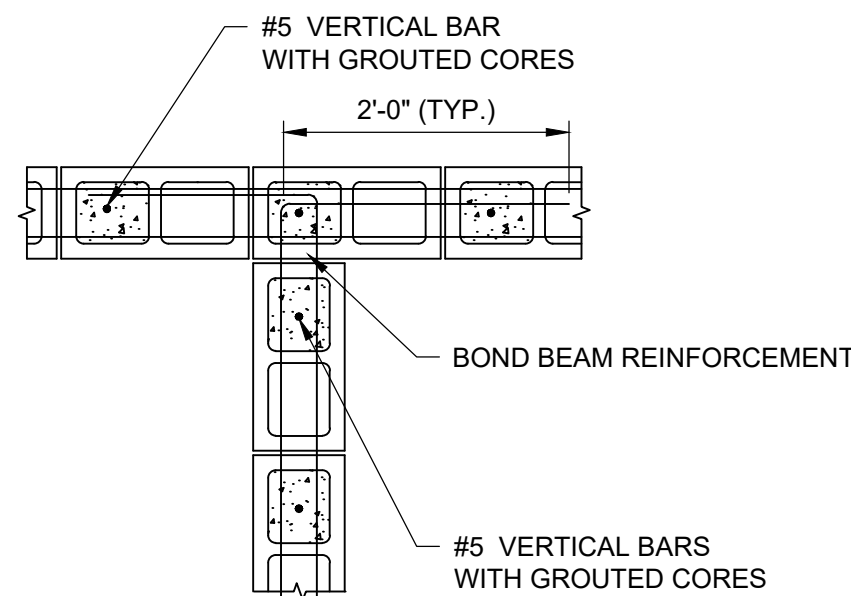
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Scale NTS



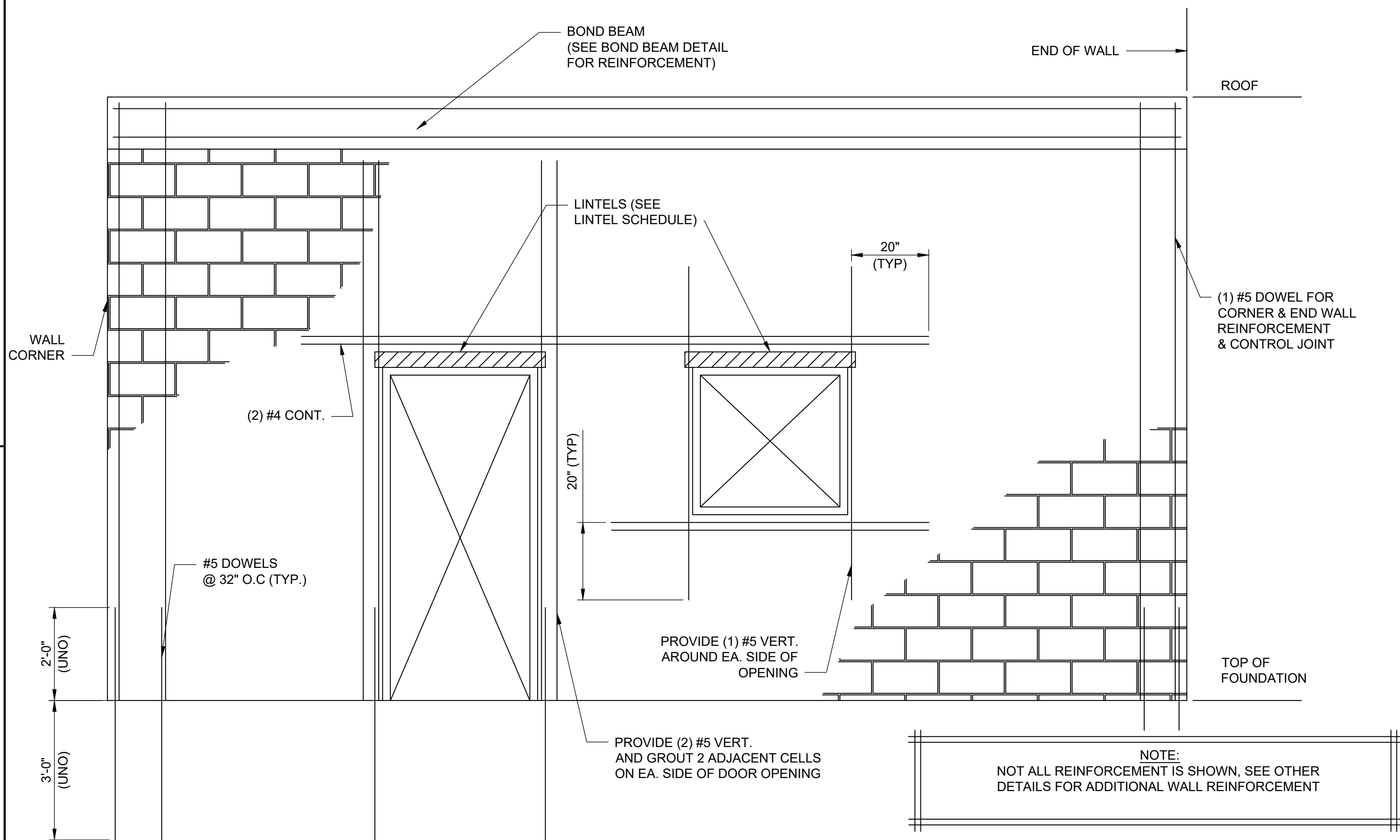
TYPICAL MASONRY CONTROL JOINT DETAIL
Scale NTS



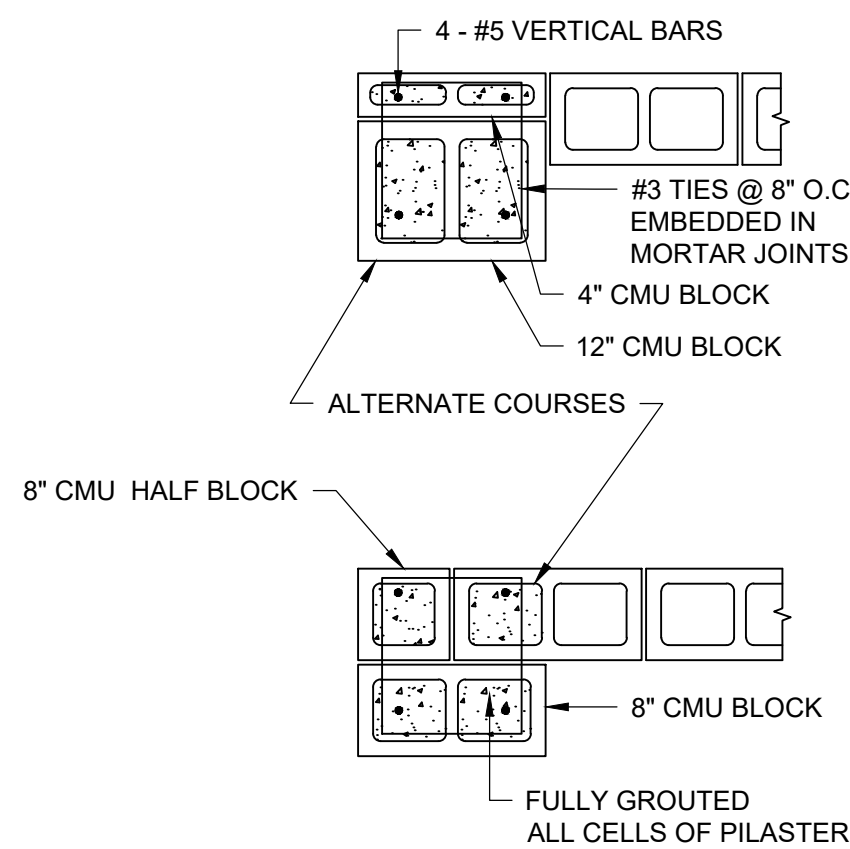
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Scale NTS



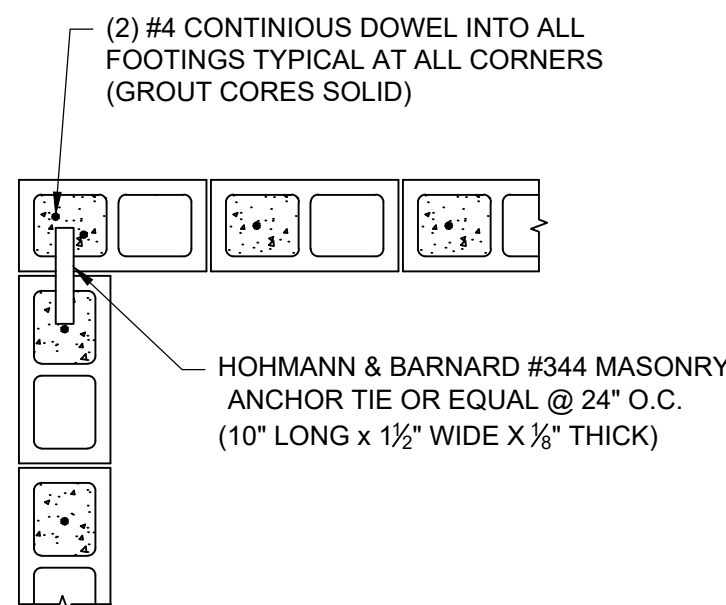
TYPICAL BOND BEAM INTERSECTION DETAIL
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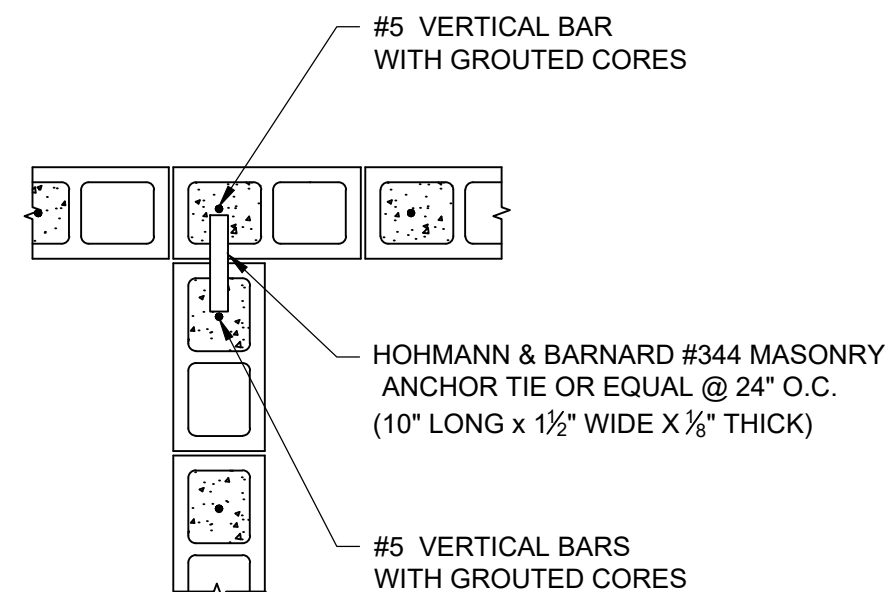
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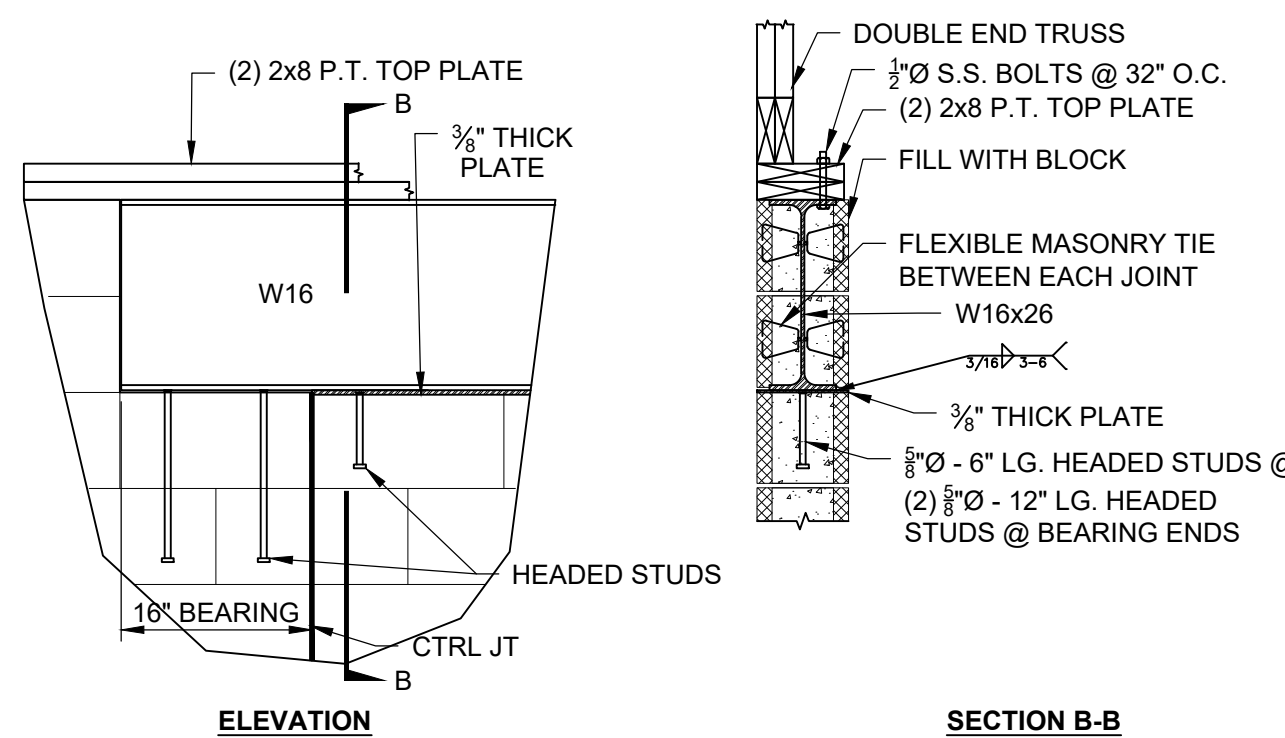
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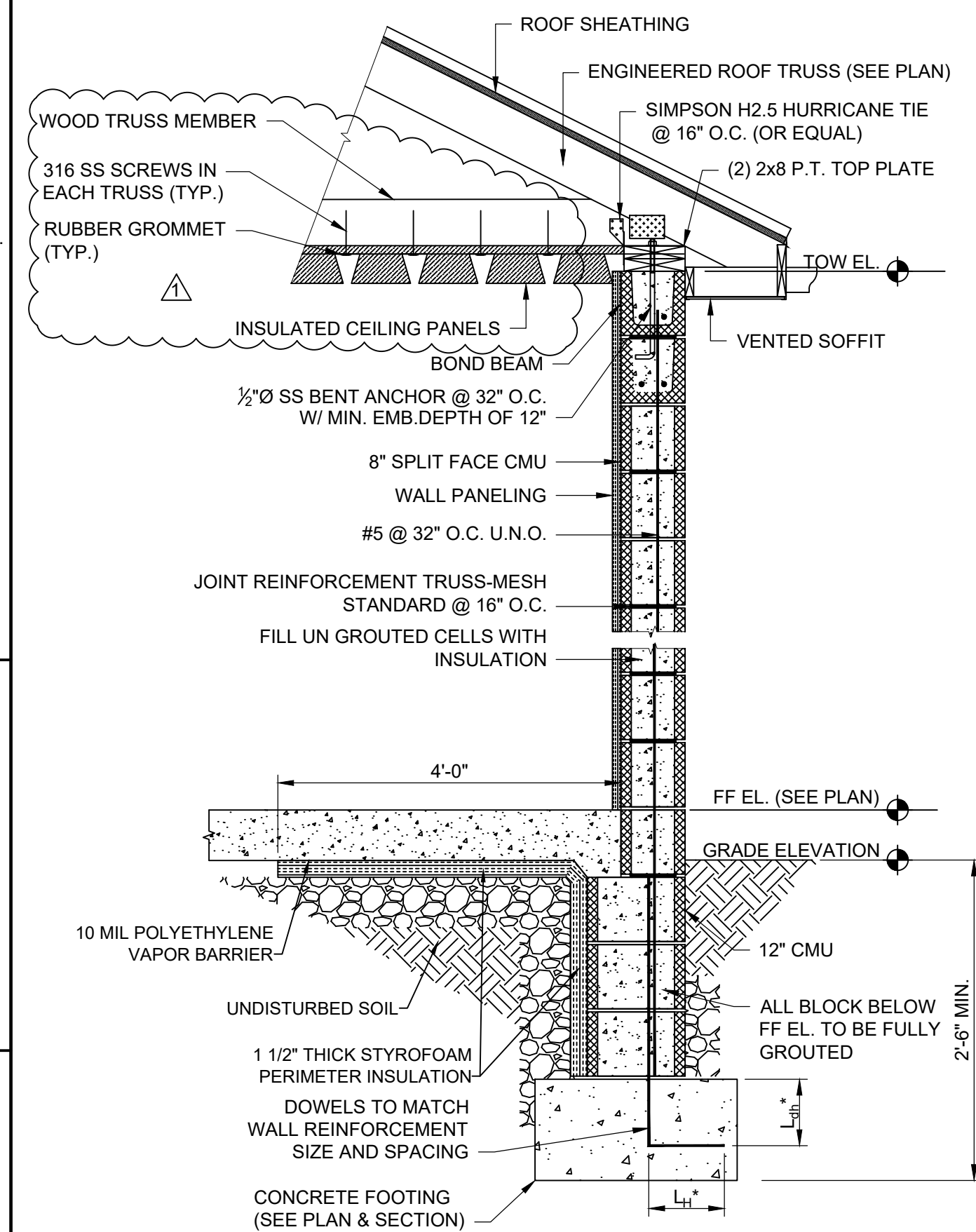
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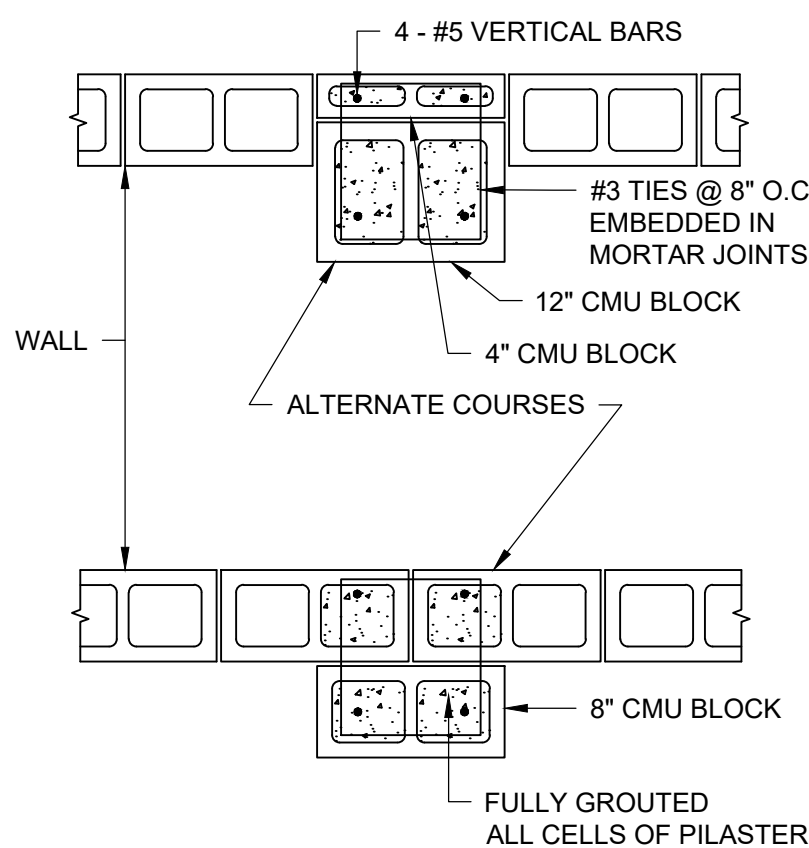
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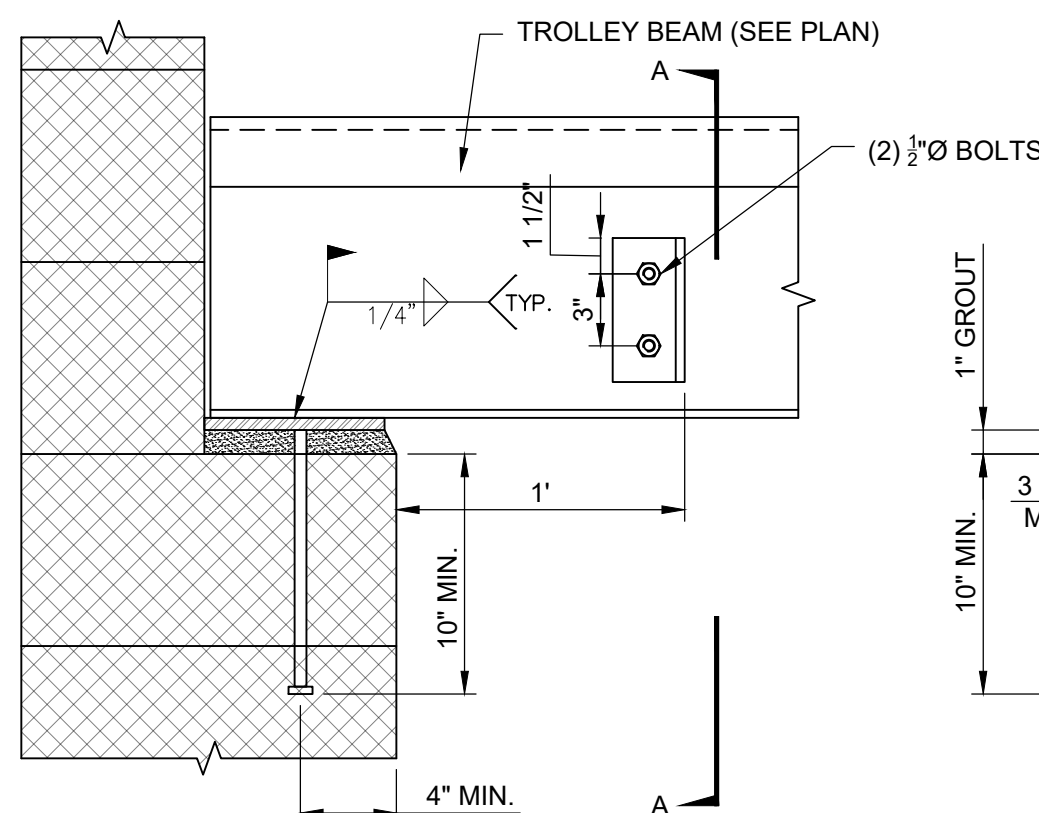
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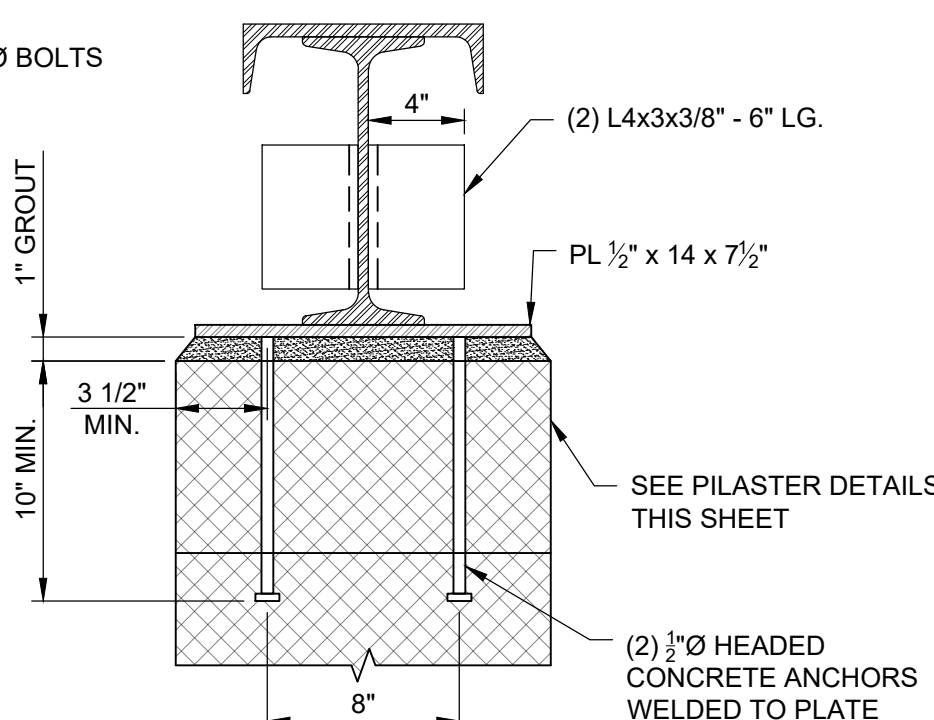
TYPICAL MASONRY WALL SECTION
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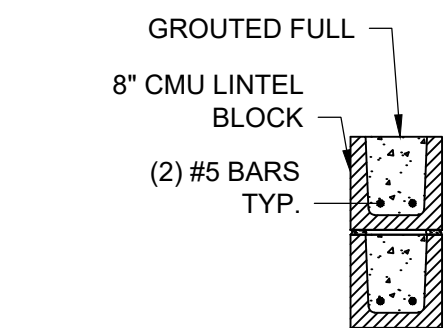
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S-03
DETAIL
Scale: N.T.S.



ELEVATION



SECTION A-A



BOND BEAM DETAIL
Scale NTS

PROJECT

SOUTH WELL FIELD
WATER TREATMENT
PLANT UPGRADES

OWNER

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REGISTRATION

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1	2019-11-05	ADDENDUM 3
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KEY PLAN

PROJECT NUMBER

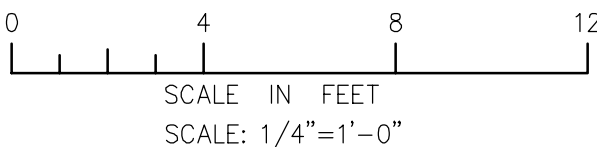
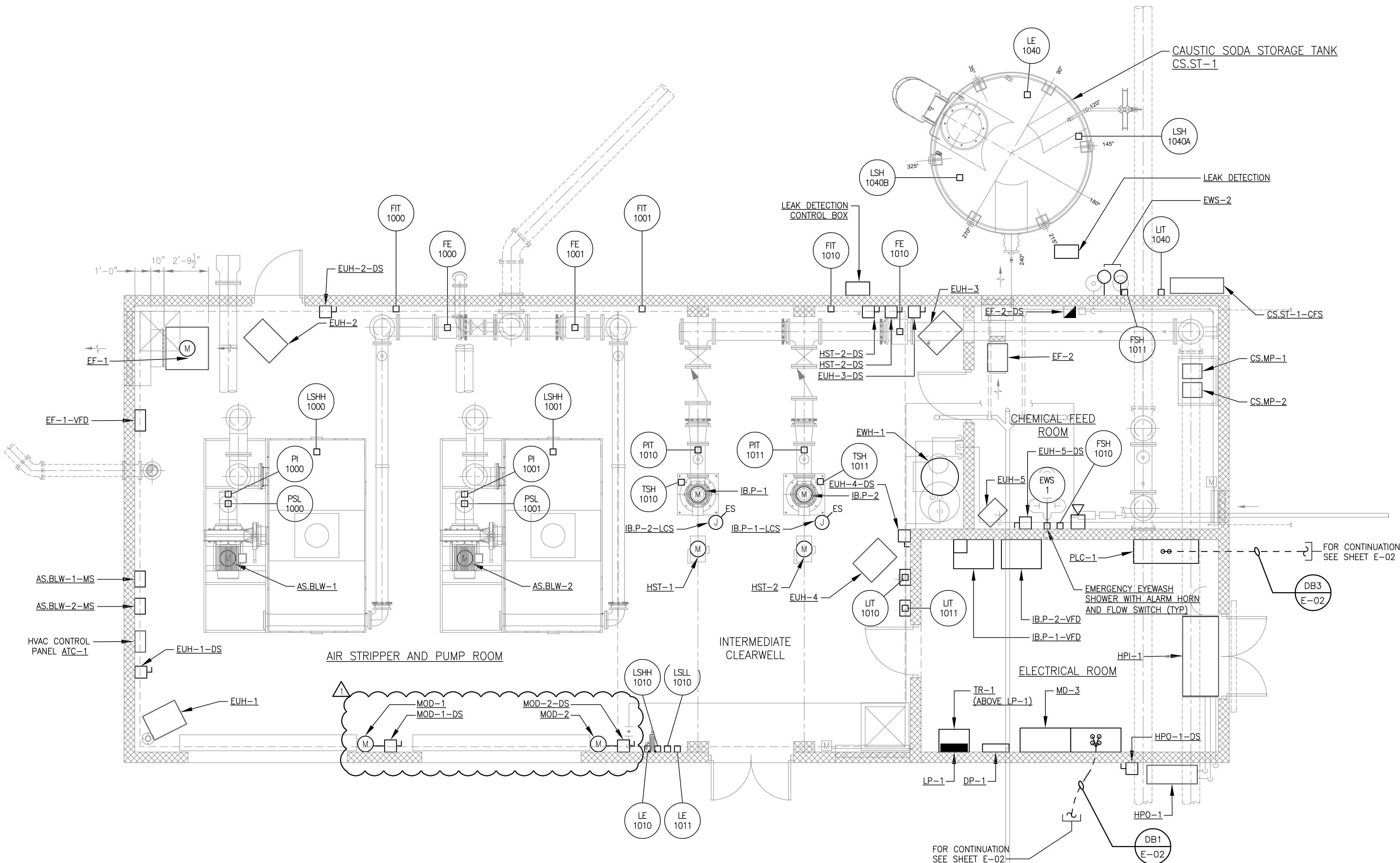
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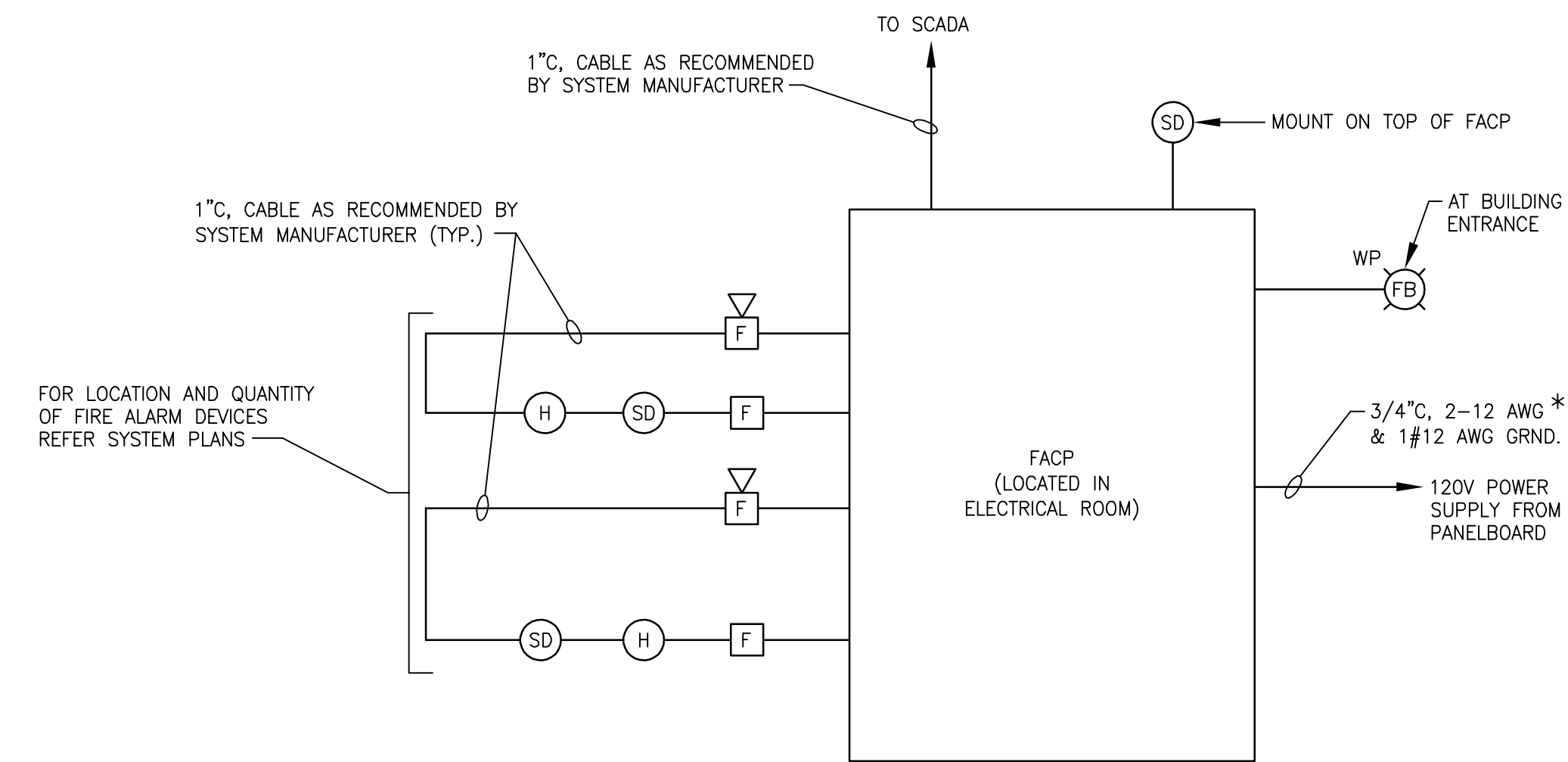
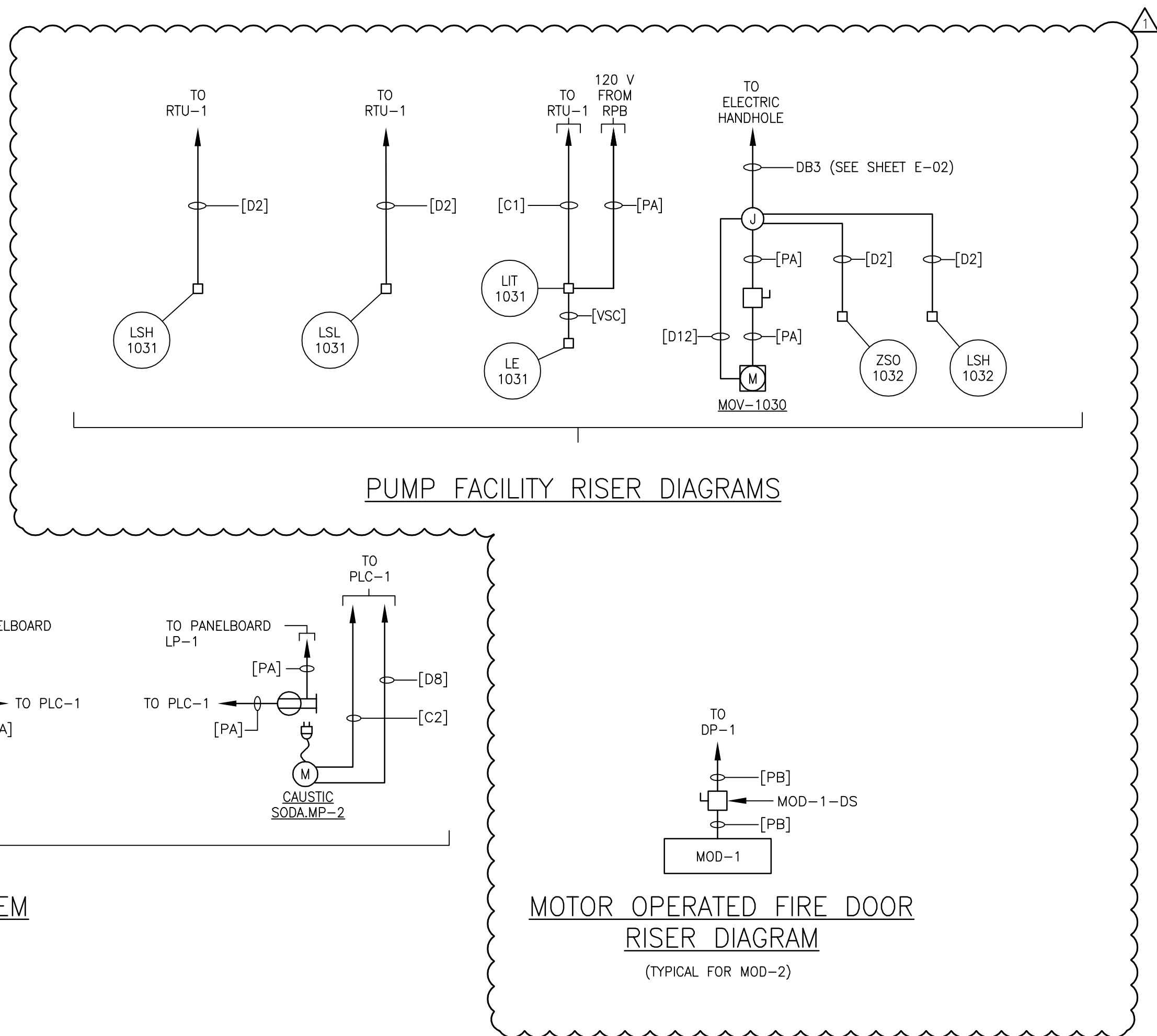
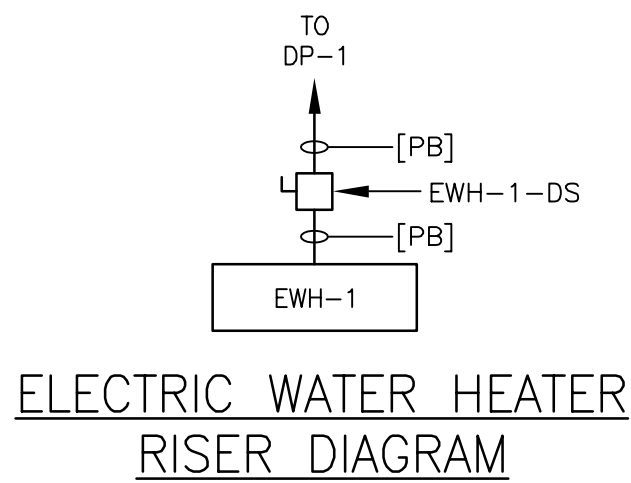
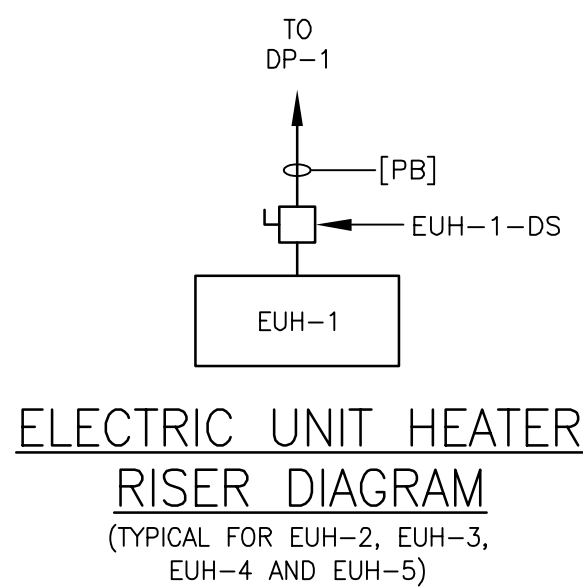
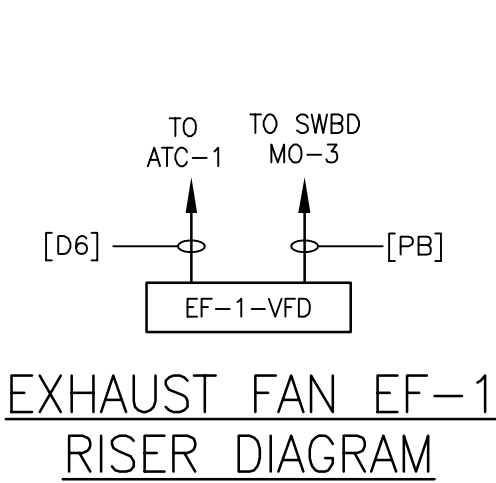
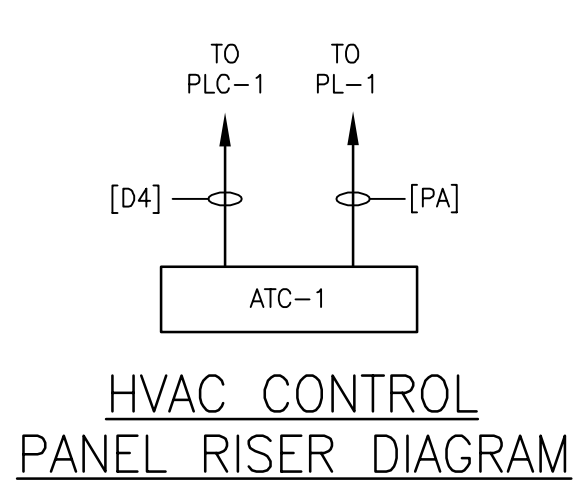
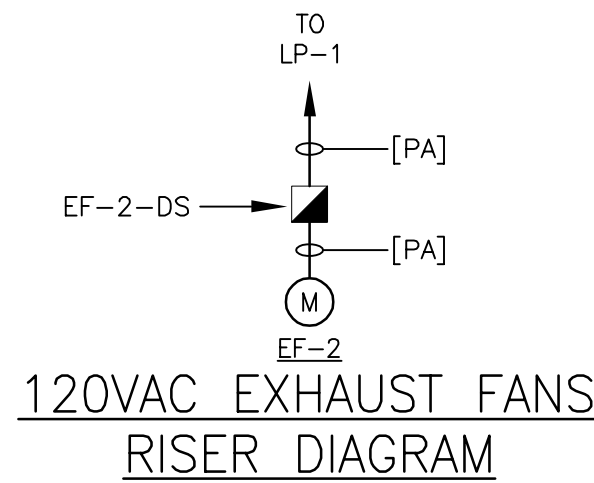
AIR STRIPPER BUILDING POWER
PLAN

SHEET NUMBER

E-06

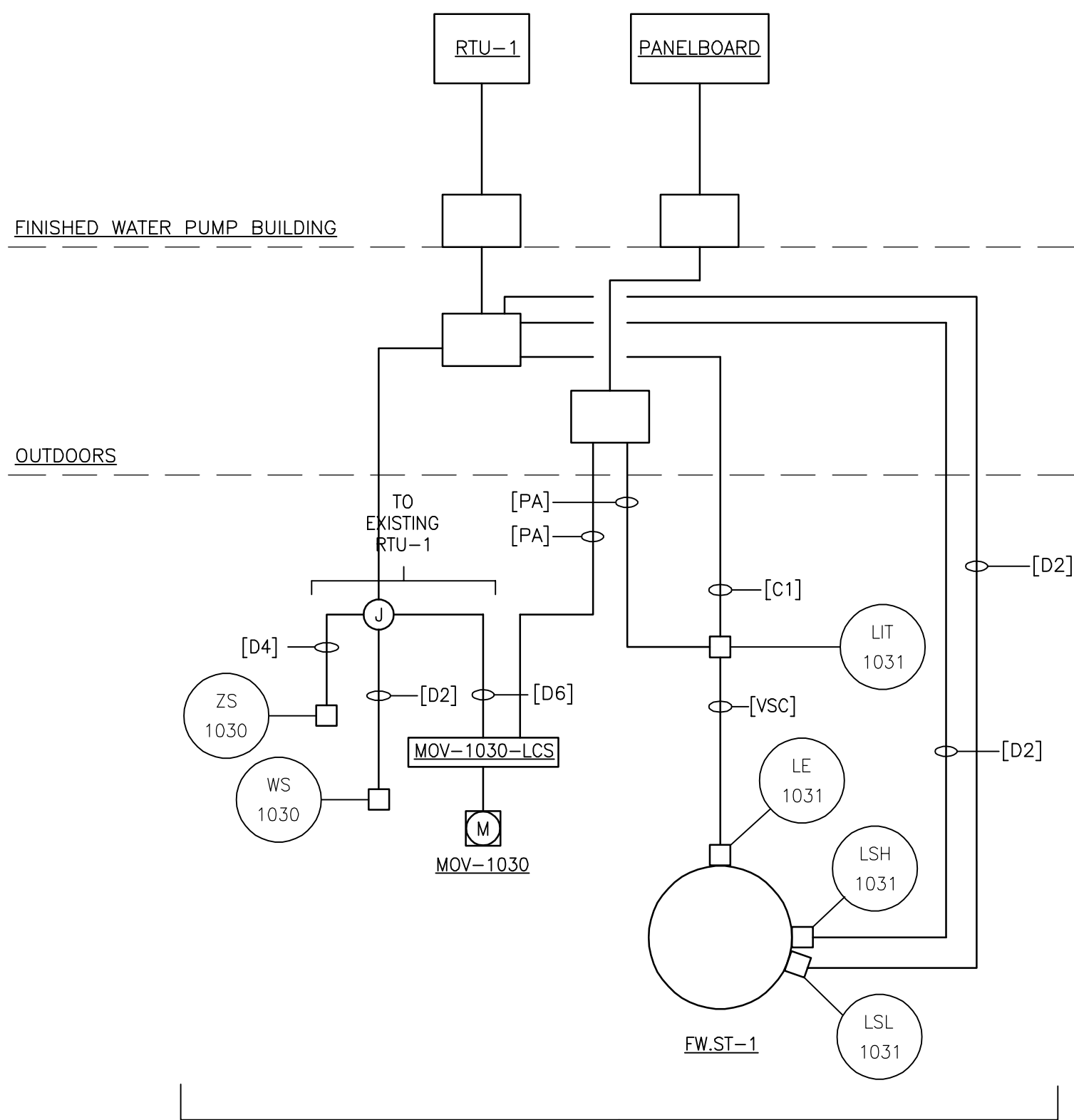


Project Management Initials: _____ Designer: _____ Checked: _____ Approved: _____

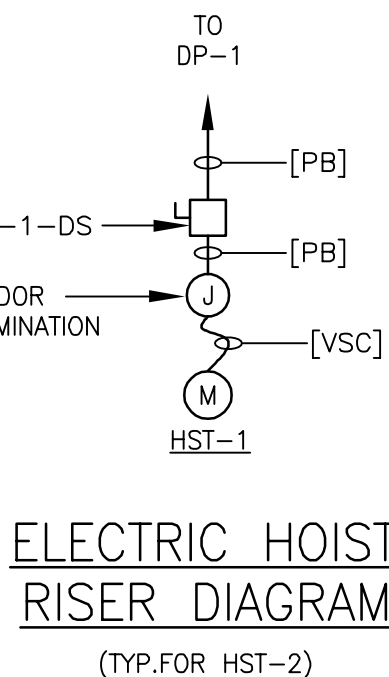
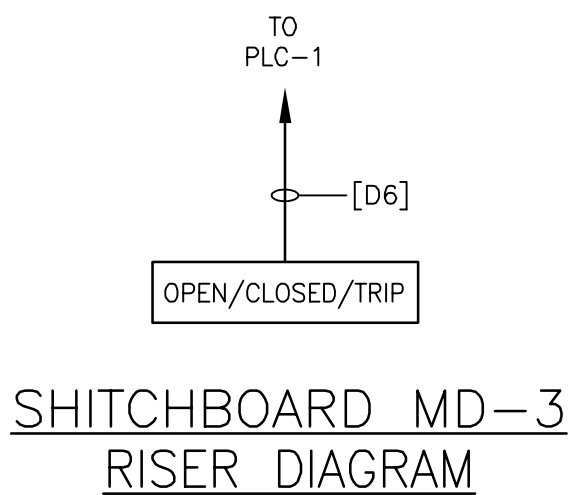


AIR STRIPPER BUILDING
FIRE ALARM RISER DIAGRAM
NOT TO SCALE
* LABEL CONDUIT "FIRE PANEL POWER SUPPLY"

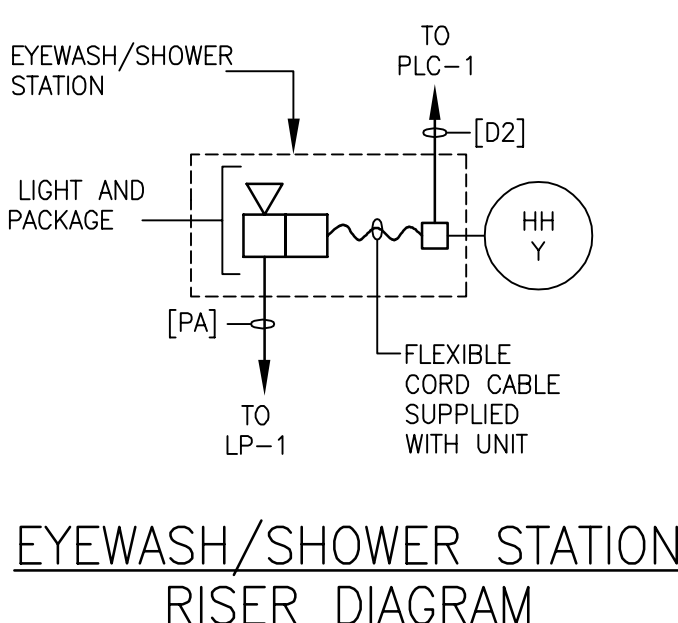
- NOTE:
1. PROVIDE ALL NECESSARY EQUIPMENT AND PROGRAMMING TO INTERGRATE THE AIR STRIPPER BUILDING FIRE ALARM CONTROL PANEL INTO THE EXISTING PLANT SCADA SYSTEM.



FINISHED WATER PUMPS
RISER DIAGRAM

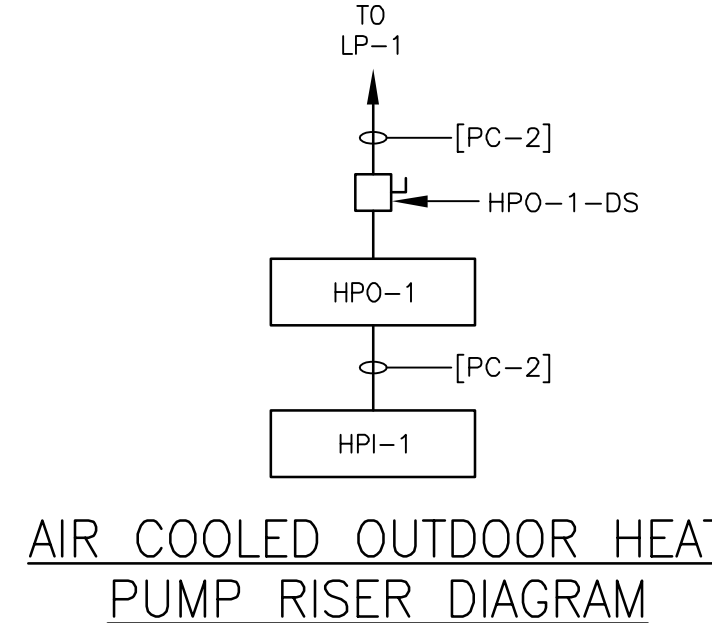


ELECTRIC HOIST
RISER DIAGRAM
(TYP. FOR HST-2)

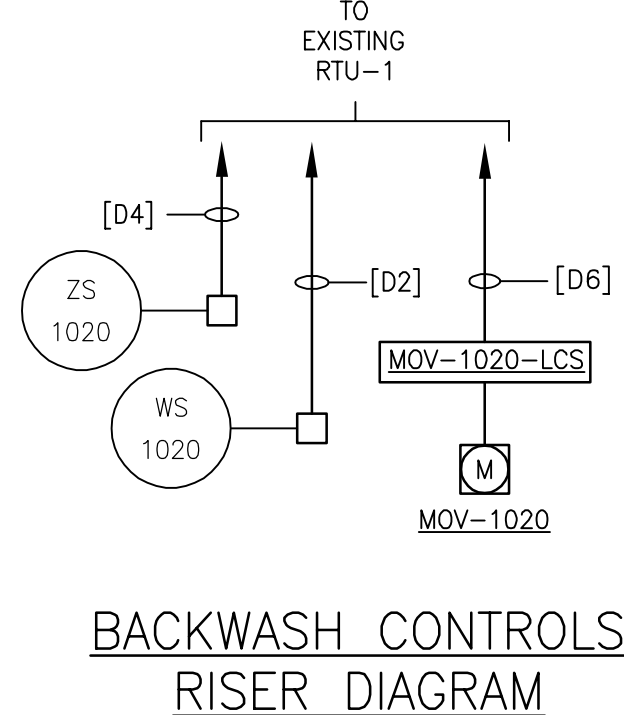


EYEWASH/SHOWER STATION
RISER DIAGRAM

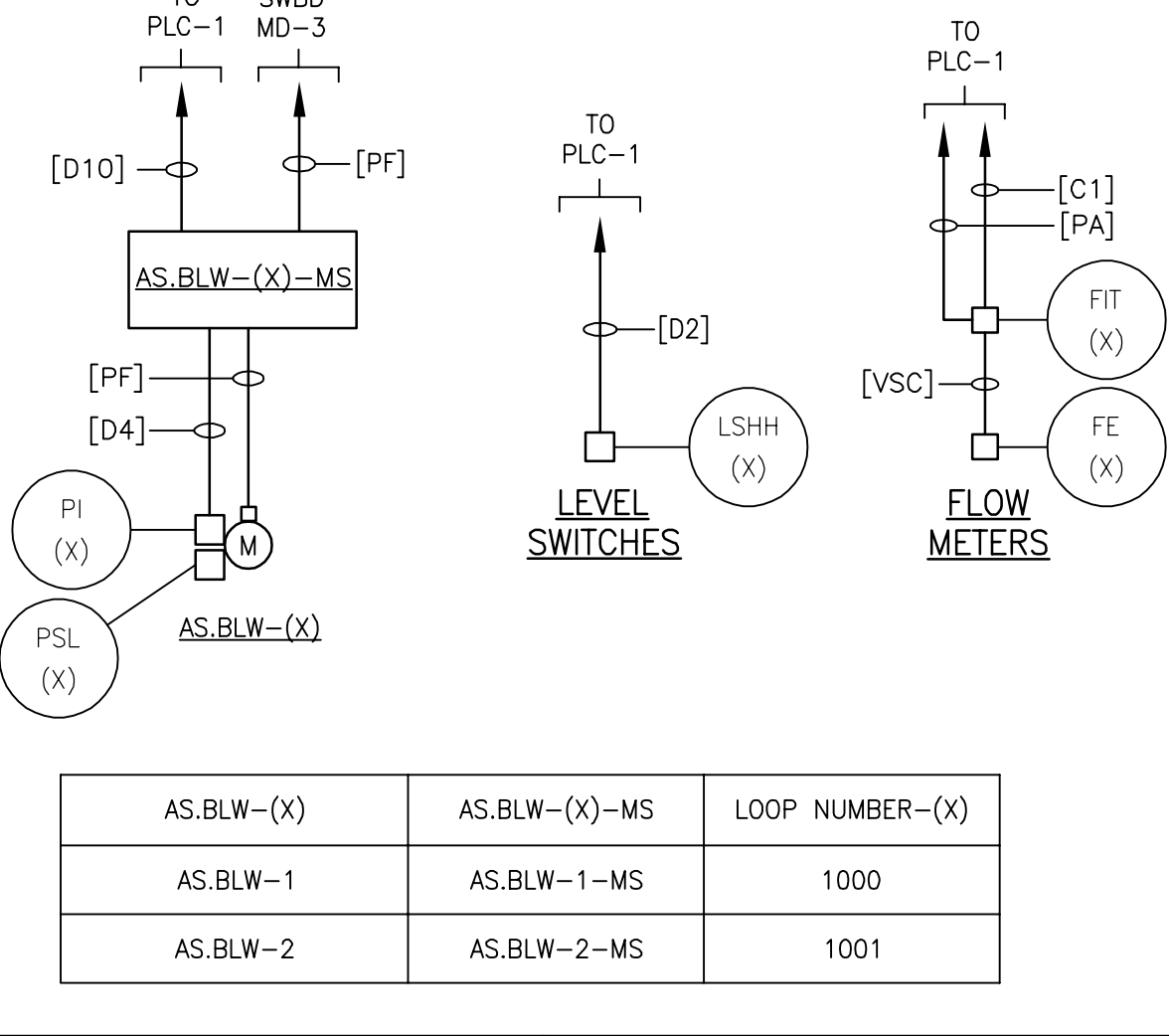
EYEWASH/SHOWER STATION	FSH-(Y)
EWS-1	FSH-1010
EWS-2	FSH-1011



AIR COOLED OUTDOOR HEAT
PUMP RISER DIAGRAM

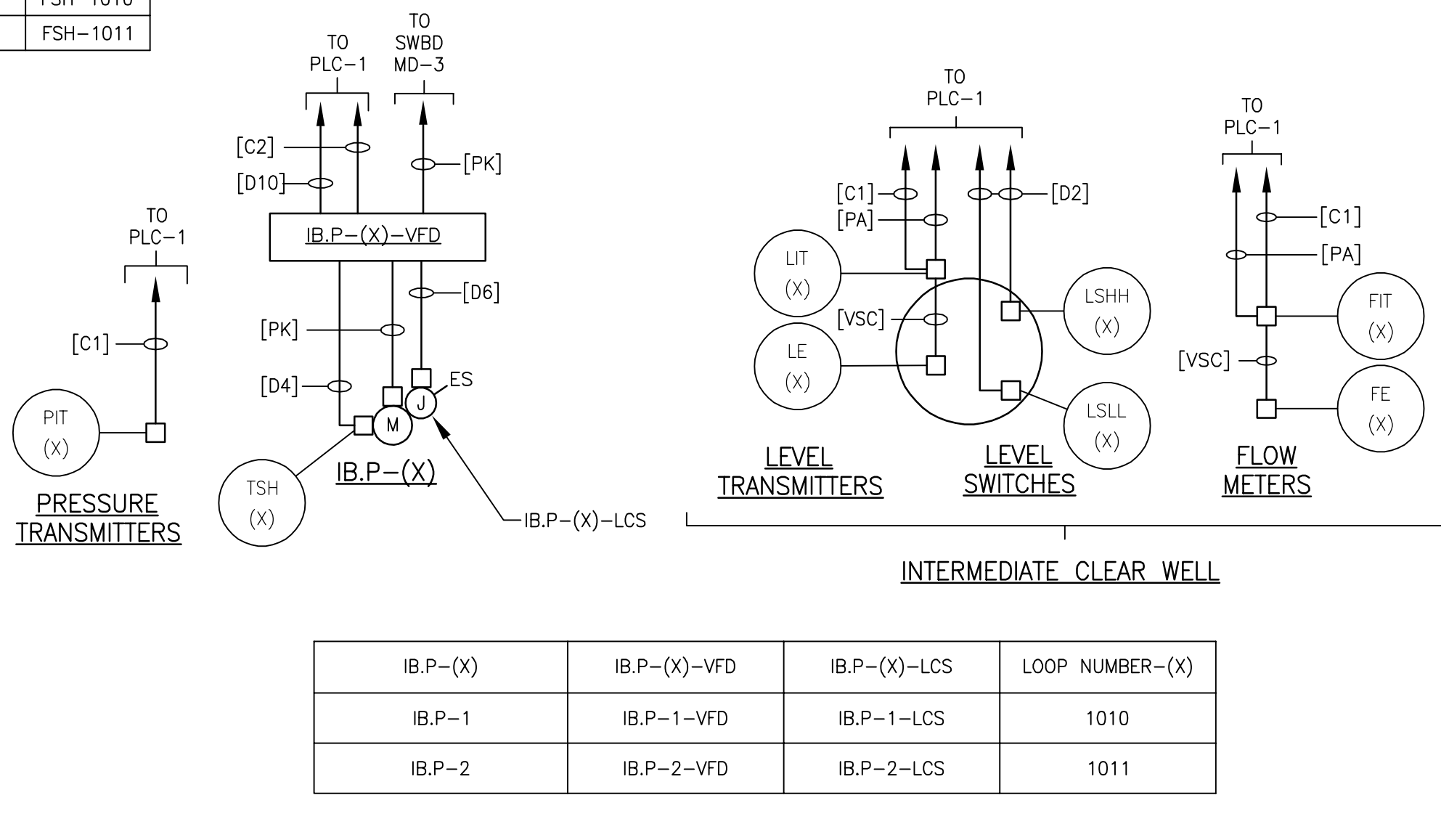


BACKWASH CONTROLS
RISER DIAGRAM



AS.BLW-(X)	AS.BLW-(X)-MS	LOOP NUMBER-(X)
AS.BLW-1	AS.BLW-1-MS	1000
AS.BLW-2	AS.BLW-2-MS	1001

AIR STRIPPER BLOWER AS.BLW-1
RISER DIAGRAM
(TYPICAL FOR AS.BLW-2)



IB.P-(X)	IB.P-(X)-VFD	IB.P-(X)-LCS	LOOP NUMBER-(X)
IB.P-1	IB.P-1-VFD	IB.P-1-LCS	1010
IB.P-2	IB.P-2-VFD	IB.P-2-LCS	1011

INTERMEDIATE BOOSTER PUMP IB.P-1
RISER DIAGRAM
(TYPICAL FOR IB.P-2)

PROJECT

SOUTH WELL FIELD
WATER TREATMENT
PLANT UPGRADES

OWNER

CITY OF NEWARK
PUBLIC WORKS and
WATER RESOURCES

220 South Main Street
Newark, DE 19711
302.366.7000 tel 302.366.7160 fax

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REGISTRATION

ISSUE/REVISION

1	2019-11-05	ADDENDUM 3
1/R	2019-09-27	ISSUE FOR BID
I/R	DATE	DESCRIPTION

KEY PLAN

PROJECT NUMBER

60598810

SHEET TITLE

ELECTRICAL RISER DIAGRAMS

SHEET NUMBER

E-11

PANELBOARD "DP-1"										SHORT CIRCUIT BRACING: 65,000 AMPS CABINET: NEMA 1																	
SERVICE: 480VAC, 3PH, 3W, 60HZ 200A MAIN CIRCUIT BREAKER: 200A FRAME, 200A TRIP						GROUND BUS																					
LOCATION	HP	KVA A	KVA B	KVA C	CIR. NO.	NEUTRAL A B C			CIR. NO.	KVA A	KVA B	KVA C	HP	LOCATION													
EUH-1	-	4.17	-	-	1		A	B	C	2	4.17	-	-	-	EUH-2												
		-	4.17	-	3					4	-	4.17	-														
		-	-	4.17	5					6	-	-	4.17														
EUH-3	-	4.17	-	-	7					8	4.17	-	-	-	EUH-4												
		-	4.17	-	9					10	-	4.17	-														
		-	-	4.17	11					12	-	-	4.17														
EUH-5	-	2.5	-	-	13					14	4.00	-	-	-	EWH-1												
		-	2.5	-	15					16	-	4.00	-														
		-	-	2.5	17					18	-	-	4.00														
HST-1	2	0.94	-	-	19					20	0.94	-	-	2	HST-2												
		-	0.94	-	21					22	-	0.94	-														
		-	-	0.94	23					24	-	-	0.94														
MOD-1	1/2	0.30	-	-	25					26	0.30	-	-	1/2	MOD-2												
		-	0.30	-	27					28	-	0.30	-														
		-	-	0.30	29					30	-	-	0.30														
SPARE	-	-	-	-	31					32	-	-	-	-	SPARE												
		-	-	-	33					34	-	-	-														
		-	-	-	35					36	-	-	-														
SPARE	-	-	-	-	37					38	-	-	-	-	SPARE												
		-	-	-	39					40	-	-	-														
		-	-	-	41					42	-	-	-														
KVA PH A: 25.72 KVA PH B: 25.72 KVA PH C: 25.72 KVA TOTAL CONNECTED LOAD: 77.07 KVA						SPD			ALL BRANCH C/B 100 AMP FRAME 20 AMP TRIP (UNLESS OTHERWISE NOTED) PANEL LOCATION: FILTER SUPPORT BUILDING ELECTRICAL ROOM																		

PANELBOARD "LP-1"										SHORT CIRCUIT BRACING: 10,000 AMPS CABINET: SURFACE MOUNTED											
SERVICE: 208/120V, 3PH, 4W, 60HZ MAIN CIRCUIT BREAKER: 100A FRAME, 100A TRIP						GROUND BUS															
LOCATION	HP	KVA A	KVA B	KVA C	CIR. NO.	NEUTRAL A B C				CIR. NO.	KVA A	KVA B	KVA C	HP	LOCATION						
AIR-COOLED HEAT PUMP HPO-1	-	2.80	-	-	1		2	-	-	-	-	SPARE									
	-	-	2.80	-	3		4	-	0.20	-	-	CAUSTIC SODA FILL STATION CS-ST-1-CFS									
EF-2	-	-	-	0.86	5		6	-	-	0.36	-	ELECTRICAL ROOM RECEPTABLES									
PUMP AND BLOWER ROOM LIGHTING	-	0.64	-	-	7		8	0.36	-	-	-	CHEMICAL FEED ROOM RECEPTABLES									
ELECTRICAL ROOM LIGHTING	-	-	0.18	-	9		10	-	-	-	-	PLC-1									
CHEMICAL FEED ROOM LIGHTING	-	-	-	0.18	11		12	-	-	0.36	-	PUMP AND BLOWER ROOM RECEPTABLES									
EXTERIOR BUILDING MOUNTED LIGHTING	-	0.22	-	-	13		14	0.36	-	-	-	PUMP AND BLOWER ROOM RECEPTABLES									
CS.MP-1 METERING PUMP #1	-	-	0.22	-	15		16	-	0.36	-	-	EXTERIOR BUILDING MOUNTED RECEPTABLES									
CS.MP-2 METERING PUMP #2	-	-	-	0.22	17		18	-	-	0.36	-	EXTERIOR BUILDING MOUNTED RECEPTABLES									
EYEWASH SHOWER EWS-1	-	0.20	-	-	19		20	0.1	-	-	-	LIT-1031									
EYEWASH SHOWER EWS-2	-	-	0.20	-	21		22	-	-	-	-	SPACE									
SPACE	-	-	-	-	23		24	-	-	-	-	SPACE									
SPACE	-	-	-	-	25		26	-	-	-	-	SPACE									
SPACE	-	-	-	-	27		28	-	-	-	-	SPACE									
SPACE	-	-	-	-	29		30	-	-	-	-	SPACE									
SPACE	-	-	-	-	31		32	-	-	-	-	SPACE									
SPACE	-	-	-	-	33		34	-	-	-	-	SPACE									
SPACE	-	-	-	-	35		36	-	-	-	-	SPACE									
SPACE	-	-	-	-	37		38	-	-	-	-	SPACE									
SPACE	-	-	-	-	39		40	-	-	-	-	SPACE									
SPACE	-	-	-	-	41		42	-	-	-	-	SPACE									
KVA PH A: 4.68 KVA PH B: 3.96 KVA PH C: 2.34 TOTAL CONNECTED LOAD: 8.22 KVA						ALL BRANCH C/B 100 AMP FRAME 20 AMP TRIP (UNLESS OTHERWISE NOTED) PANEL LOCATION: FILTER SUPPORT BUILDING ELECTRICAL ROOM															

* GFCI CIRCUIT BREAKER

PROJECT

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KEY PLAN

PROJECT NUMBER

60598810

SHEET TITLE

PANELBOARD SCHEDULES

SHEET NUMBER

E-12